

## The Polychromy of the Giant Buddha Statues in Bāmiyān

### Introduction

Traces of paint have been observed and mentioned since the 19<sup>th</sup> century, but there has never been an examination.

When clay fragments of the Buddha statues were recovered from the rubble it became obvious that many of them showed remnants of paint layers. Although damaged and often hidden under clay-coloured layers, different colours could be distinguished.

Observed colours have been recorded in the fragment catalogue. In most cases, red, reddish ochre or greyish red are mentioned; in addition, brown, white, yellow ochre and blue are listed. However, there was no possibility for a thorough investigation on-site.

Though the material is abundant, there are grave deficiencies. The original position of almost all the fragments is unknown. A large number of pieces are missing as a result of the explosion. The surviving fragments were found scattered in the rubble at the feet of the Buddha statues. Most of them are too damaged or too small to be assigned to specific positions. They vary in shape and thickness, and the edges of the fragile clay are broken off, so they cannot be reassembled into larger areas. Conclusions can only be drawn on the basis of the surface shape or the structure of the clay support of larger fragments. Some fragments can be recognised as fold ridges in this way. The only distinction that can be made with some certainty is that between parts of the sculptures and fragments of the murals.

The identification of materials seemed to be appropriate as a base for all further considerations and interpretations. At the same time, literary sources and pictures were checked meticulously for hints on the colouration or on the remnants of paint layers. 276 tiny fragments of clay with paint layers were available for investigation, 173 coming from the Western Buddha, 103 from the Eastern Buddha. All fragments have been examined carefully. Microscopic examination, cross sections and pigment identification have been performed with support from Monica Reiserer, Nicole Wagner and Maximilian Knidlberger, students at the Technische Universität München, Chair of Restoration, under the supervision of Stephanie Pfeffer.

### Historical records on paint layers

All preserved pictures, i.e. drawings and photographs, show the statues brown and monochrome. Nevertheless, written

sources refer to colours and occasionally even mention paint layers. These records are the only chance to find some evidence on the distribution of colours and now and then even hint at changes of the visual impression over time. The earliest source to be mentioned dates back to the time of the creation of the statues. In the *Xi you ji*, describing his journey to India between c. 629–645, the Chinese monk Xuanzang writes about Bāmiyān:

*‘To the north-east of the royal city there is [...] a stone figure of Buddha, erect, in height 140 or 150 feet. Its golden hues sparkle on every side, and its precious ornaments dazzle the eyes by their brightness’. [...] To the east of this spot there is a convent, which was built by a former king of the country. To the east of the convent there is a standing figure of Sākya Buddha, made of metallic stone (teou-shih) in height 100 feet. It has been cast in different parts and joined together, and thus placed in a complete form as it stands.*<sup>69</sup>

The interpretation and the origin of the non-Chinese term *teou shih* is difficult. It seems to denote either a metallic, copper-containing stone or a metal. The indication that the statue was produced in parts led to the conclusion that a metal sculpture was meant which has been lost since then. However, the description mentions two giant Buddha statues, and the cited heights of 47 to 50 m and 33 m correspond fairly well to the two existing Buddha statues. If Xuanzang refers to the two existing statues, the first one, being made of stone, with sparkling golden hues and precious ornaments, would be the taller Western Buddha, and the other one would be the smaller Eastern Buddha appearing as if made of metal. As it is not proven that Xuanzang visited Bamiyan and saw the Buddha statues himself, interpretations must be cautious.

Another interesting description was written some centuries later and also by a man who may not have seen the Buddha statues himself. The geographer and biographer Yakut al Hamawi travelled in Afghanistan shortly before the invasion of the Mongols in 1221. He refers to the situation before the devastation of Bāmiyān by Genghis Khan’s troops. He reports that the statues were called the ‘*red idol*’ and the ‘*white idol*’, and that they were standing in a building of an incredible height, carried by giant pillars: ‘*you see a building the summit of which is in incredible height; the summit is supported by giant pillars and is covered with paintings showing all the birds created by God. Inside are two huge idols cut into the rock and reaching from the bottom to the*

top of the mountain. One is called the red idol and the other one the white idol. You cannot find anything comparable to these two statues in the whole world.<sup>70</sup>

Although it is strange that the description sounds as if both statues were found inside *one* building, this mention of an edifice in front of the niches is interesting as it could mean that originally the niches were closed to the front or were sheltered behind a façade construction. These front buildings may have been built of wood and destroyed by the Mongols.<sup>71</sup>

The next description on colours dates from the late 18<sup>th</sup> century: *'these statues were visited at least ten or twelve times by a famous traveller, called Me'yan-Asod-Shah [...]. He informed me [Francis Wilford] lately that these statues are in two niches and about forty paces distant from each other. That the drapery is covered with embroidery and figured work; which formerly was painted of different colours; traces of which are still visible. That one seems to have been painted of a red colour; and the other, either retains the original colour of the stone, or was painted grey.'*<sup>72</sup>

There is some imprecision in this description – 40

(American) paces would correspond to 236 m, not to 800 m – and the description of the statues sounds like a compilation of Xuanzang and Yakut al Hamawi, but nevertheless it is possible that it was based on an eyewitness' account. Here the characterisation as 'red' and 'grey' is clearly connected to the dominating colours visible on the surfaces and not to names given by local people. Furthermore, it seems to be linked to the drapery as this is the largest and thus dominant part of both statues.<sup>73</sup>

Nevertheless, the paint layers were probably much reduced at that time and the overall impression obviously was not colourful. 19<sup>th</sup>-century sketches, drawn merely 30 years after Me'yan Asod Shah's visit, do not show any colours or painted decoration. The rather detailed description by Alexander Burnes of 1834 mentions the modelling, the damages, and the system of wooden pegs and plaster layers. Burnes also describes the murals preserved above the heads of the Buddha statues, but he does not mention any colours or traces of paint on the statues themselves.<sup>74</sup> The sketch he made shows some impreciseness in details and dimensions.<sup>75</sup> Nevertheless, he indicated the murals he had seen around the head of the Western Buddha, simplified as a

Fig. 1. Drawing by Alexander Burnes [BURNES 1834, next to p. 183]



spiral twine design.<sup>76</sup> The robes of the statues, however, are completely plain.

In the first scientific study on the statues, published by Maitland, Talbot, and Simpson in 1886, Maitland, who made the drawings of the statues (fig. 2), remarks: *'The idols themselves are [...] roughly hewn [...] and afterwards thickly overlaid with stucco [...]. The stucco appears to have been painted or at least paint was used in some places.'*<sup>77</sup>

The sketches are quite precise regarding shape and dimensions: The proportions are realistic. Details of the drapery are depicted precisely. The cut-out faces can be recognised. Even technical details and damages like the losses on the legs and arms of the Western Buddha and the holes for the anchoring beams exposed in these areas are depicted. The drawings are black and white, however, and do not indicate any colouring.

In the later 1920s, J. Carl explored the Western Buddha during the DAFA campaign using a rope which helped him to climb down on the right forearm of the Buddha (fig. 3). He described what Hackin and he could see of the technology of

the *sangati*: *'We have collected fragments which imitated the drapery of the monk's robe. They still possessed their armature made of ropes and pegs, and covered with a red paint layer which originally had covered the entire robe (fig. 24).'*<sup>78</sup>

The German edition of the visitors' guide to the caves and statues of Bāmiyān of 1939, compiled by Joseph and Ria Hackin in 1934, mentioned traces of paint, but only for the Eastern Buddha: *'On the sleeve there are still some traces of red and blue paint and on the chin remnants of gold coating.'*<sup>79</sup>

The Indian restorers of the Indo-Afghan co-operation in 1969-78 recognised remnants of paint, but did not record them. Sengupta briefly mentions the painted clay layers of the Eastern Buddha: *'Traces of pigments on the plaster show that the exposed parts of the body were painted in gold and the garment in blue.'*<sup>80</sup>

At the end of their interventions, the restorers applied a suspension of clay and gypsum on all surfaces of the statues. This was done to unify and harmonise the overall impression, either because the restorers wanted to incorporate the newly reconstructed and repaired parts or because they were convinced that the statues were originally intended to appear

Fig. 2. Drawings by Maitland [TALBOT / SIMPSON 1886, p. 348]





Fig. 3. Hackin/Carl 1933, fig. 24: *sangati* of the Western Buddha

like unpainted stone. Thus, at least after 1978, the statues looked uniformly grey-brown.

Summarising the information about colours in historical sources, we can state that the earliest of them mentions ornaments and sparkling, and perhaps a metallic appearance. Since the 11<sup>th</sup> century the names of *Surkh-but* (Red Buddha) and *Khink-but* (White Buddha) can be found in descriptions of Islamic writers.<sup>81</sup> A relation to the dominating colours seems likely, although white is not a usual colour for Buddhist garments, since in Asian and Buddhist countries white is the colour of death and mourning.

The first precise mention of paint layers goes back to Maitland in 1885. The few, but nevertheless consistent statements in the literature are:

Western Buddha	<i>sangati</i> :	red
Eastern Buddha	garment:	red and blue; blue
	skin; chin:	gold

#### Possible colour distribution on the statues

For the interpretation of the different colours found, it is helpful to keep in mind how the statues are designed. With regard to the modelling, five main parts can be distinguished:

1. the outside of the *sangati* which is the largest part of the statue;

2. the lining of the *sangati* which might have been visible at the insides of the folds hanging over the arms;
3. the undergarment (*uttarasanga*), which has been visible underneath the *sangati* and perhaps at the forearms. At least at the Eastern Buddha it was visible at the lower parts of the legs, being longer than the *sangati*;
4. the skin, which after the loss of the hands and the severe damage of the feet was only preserved on the necks and faces;
5. the hair of which some strands near the ears were still preserved on both statues.

In addition, there may have been painted details such as patterns on the *sangati*, the lips or decorations in the hair. Due to earlier damages and losses, probably no traces of hair decorations or the lips were still existent before the destruction, but there could have been decorations on the *sangati*. The literary sources contain no evidence for colours or style, except the vague descriptions of “golden hues” and “precious ornaments”, mentioned by Xuanzang, or the reference to “embroidery and figure work” reported by Me’yan Asod Shah.

The characterisations as a grey and a red Buddha can be interpreted as an overall impression and therefore related to the dominating colour of the garment. On the other hand, it can also refer to a more reddish or whitish clay surface.<sup>82</sup> Iconographic specifications regarding the colours of the clothes are not possible, as there is no consistent canon for Buddha’s robes.

#### Examination of the paint layer sequences

The examined samples comprise 275 small pieces of painted clay, mostly between 1 and 4 cm in length (fig. 4). As most of them were not included in the list of findings set up in Bāmiyān, because they were too small, a new numbering system was set up.

The examination was mainly executed under the stereo microscope at 50 times magnification. In many cases this was sufficient to understand the layer sequence and had the advantage of being non-invasive. Groups of similar samples were formed. Some samples of each group were selected for cross sections to examine the layer sequences in detail. The pigments were identified for each group on significant fragments.

A very important result was that on most samples there is more than one paint layer. That means that the statues have been repainted. Several sequences of layers could be observed on a larger number of samples.

Underneath the paint layers, often a slightly reddish or brownish and sometimes transparent and slightly glossy layer can be observed which seems to have penetrated into the clay surface. This can be interpreted as a pre-treatment with an organic binder to obtain a dust-free surface, to reduce the danger of dissolving the clay and to homogenize the suction of the support. This kind of isolation layer on the clay plaster has been observed on the murals as well.<sup>83</sup>

Different from the murals, most of the samples do not show a white priming layer. If a white priming is found, it often is

not a coherent layer, but consists of tiny remnants or partially present spots. This applies to all samples, independent of colour or layer sequences.

On top of the paint layers, almost all samples show a light ochre layer which can be attributed to the Indo-Afghan restoration. This layer mostly consists of a clay suspension, sometimes mixed with charcoal or gypsum, probably to adjust the colour. Some samples show a more compact clay layer which seems to be a completion and can contain the same type of plant fibres also found in the gypsum fillings. Additionally, splashes of white and brownish pink or bright ochre can be found on top of the paint layers or the clay suspension, probably from retouching completions.<sup>84</sup> Larger spots or streaks come from gypsum accidentally dropped on the surface. Some fragments are coated with a transparent, glossy, slightly elastic material which probably is a modern synthetic consolidant. On some fragments fibres stick to this layer, obviously from an attempt to wipe off the surplus of consolidant.<sup>85</sup> In the following the materials of the Indo-Afghan restoration are not mentioned further.

The samples have been classified into six different groups with several subcategories. Most of the groups can be found on both statues. All samples of one group show similar layer sequences which are described in the following. Understanding the layer sequences and the relation between the samples was a difficult task due to the fact that the samples differ extremely in state of preservation and thus

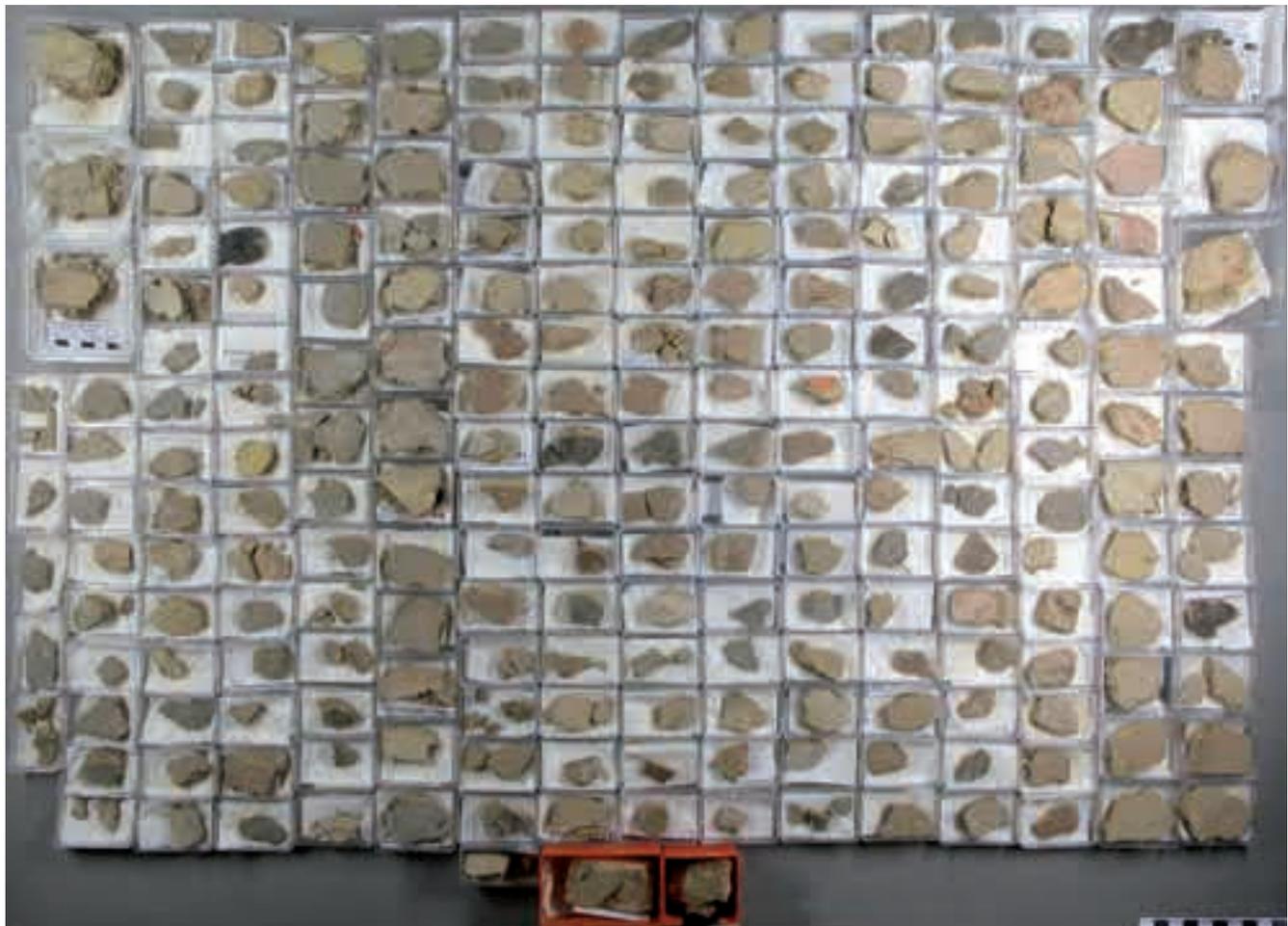
in their visual impression. Most fragments are partly or completely covered with the clay suspension and others are blackened by soot. On many fragments the paint layers are thinned or have partially flaked off. The confirmation if the idea about layer sequences obtained at the examination with the stereo microscope was correct could only be achieved by examining a larger number of cross sections. Although in the end most fragments could be assigned to the groups, a number of samples only show tiny traces of paint which were difficult to understand and could not be related to any layer or sequence.<sup>86</sup>

The samples which are darkened or blackened by soot sometimes do not show more than vague traces of paint layers, but some can be assigned to groups 1, 2, 3 and 5, which means that they came from different parts of the robes of the statues.<sup>87</sup> It can be assumed that they belonged to lower parts or areas next to the caves where the surfaces were blackened by the soot of fires.

#### *Groups 1 and 2*

Groups 1 and 2 comprise samples which on the whole appear reddish, resulting from layers of pink, orange and red. The two groups differ regarding one aspect: In group 1, the first layer is a white priming layer which seems not to be coherent, but only preserved in some spots. It is missing in the fragments of group 2.

Fig. 4. Most of the 275 painted clay layer fragments examined in Munich [Pfeffer / Blänsdorf]



### *Western Buddha*

The first paint layer is pink. The layer is thin and of light colour. In one sample red was found instead of pink (sample ID 91). The second layer is minium-red. It is thick, soft and powdery and the surface has often discoloured to brown or even black. As minium can be found in lacunae of the pink, it obviously is a repainting. Four fragments obviously possess a double layer of orange (samples ID 59, 98, 54 from group 2 and sample ID 49 from group 2–4).

The third layer is a thin greyish-white layer which could be a priming layer rather than a paint layer. The fourth layer is a red layer. It often is rather thick, and sometimes brush marks can be distinguished. The fifth layer is a thin, hard, and semitransparent white which does not seem to be a paint layer, but a crust or coating. On top there is the light ochre applied in the restoration of 1969/78.

As two samples were taken from a fragment which can be definitely recognised as part of a fold ridge (GBL 852, fig. 5), fragments of group 1 and 2 can be interpreted as part of the outside of the *sangati*.

### *Eastern Buddha*

The first paint layer is pink, but mostly of darker pink than on the Western Buddha. Sometimes it even looks red. The pink seems to be applied in two layers.

In the only sample assigned to group 1, the pink is lighter than the one found on samples of group 2. If there was a minium layer at all, it can be only traced by single blackened particles. On top there is a thin layer containing some red particles.

In group 2, cross sections of the pink show some black or orange particles between the two layers. Underneath the pink a transparent, slightly reddish isolation layer is visible. The following layer is minium-red. It often is only preserved in traces or discernible as blackened crust. The layer seems to be thinner than that on the Western Buddha.

The third and last layer in both groups is white. In one example of group 2 there is grey on top of the white. Two samples show considerable blackening by soot.<sup>88</sup>

Fig. 5. GBL 852, part of a fold ridge, from which the samples ID 48 (group 2–4) and 169 (group 2) have been taken

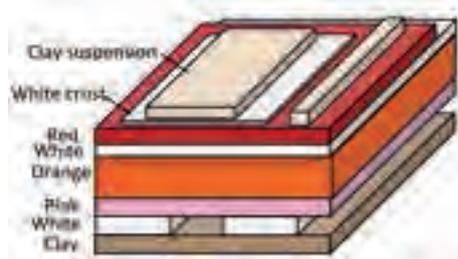


Fig. 6. Layer sequence: Western Buddha, group 1 (left) and group 2 (right)

**Group 1 – Western Buddha**



Sample ID 165, length of picture 45 mm

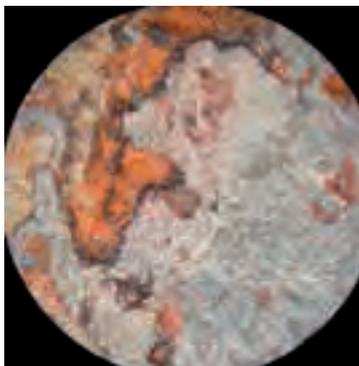


**sample ID**

all layers present: 14, 18  
 double layer of minimum: 59, 98, 54 (without pink), 49 (from group 2–4)  
 pink unclear, red in minimal traces: 112, 135

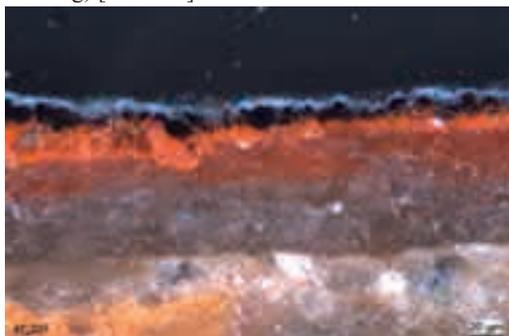
red missing: 7, 76, 81, 104, 118  
 red missing, covered with glassy brown: 47a

white and red missing: 102



ID 165, diameter of picture 9.5 mm [Pfeffer]

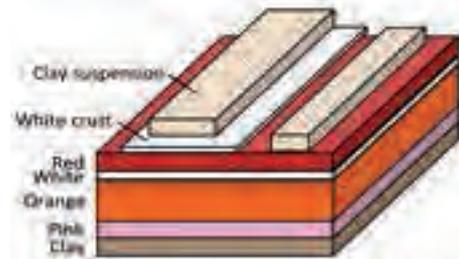
ID 47, cross section of sample, 500 times magnified (white layer appears transparent due to saturation with imbedding resin; red layer missing) [Reiserer]



**Group 2 – Western Buddha**



Sample ID 100, length of picture 45 mm



**sample ID**

all layers present: 4, 5, 8, 9, 16, 17, 22, 23, 26, 30, 35, 39, 52, 55, 56, 58, 64, 69, 72, 78, 79, 87, 91, 95, 97, 100, 107, 110, 115, 117, 125, 132, 134, 140, 146, 148, 153, 154, 161, 162, 165, 167, 168, 173

pink unclear or missing: 23, 30, 54, 153, 166

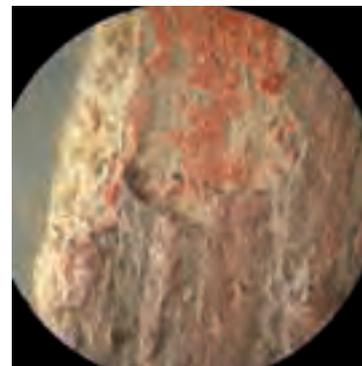
orange only in tiny traces: 32, 127

red missing: 21, 42, 109, 169; 142

red in tiny traces: 126, 144

red and white missing: 25, 282

pink, red and white missing: 43, 45



ID 97, diameter of picture 9.5 mm [Pfeffer]

ID 97, cross section of sample, 200 times magnified

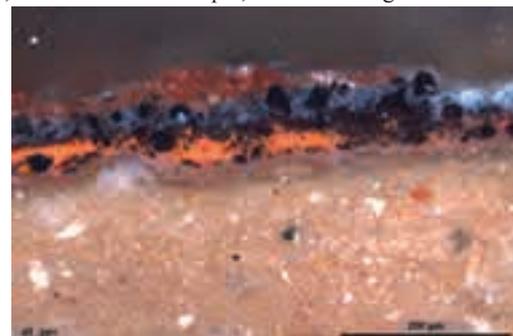
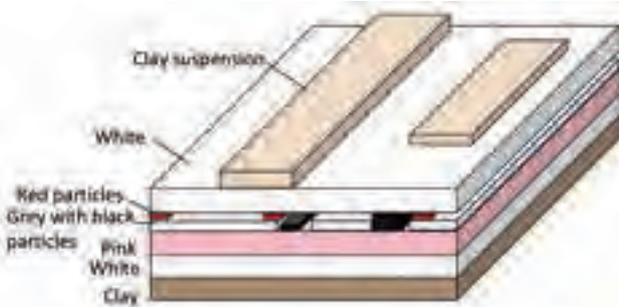


Fig. 7. Layer sequence: Eastern Buddha, group 1 (left) and group 2 (right)

**Group 1 – Eastern Buddha**



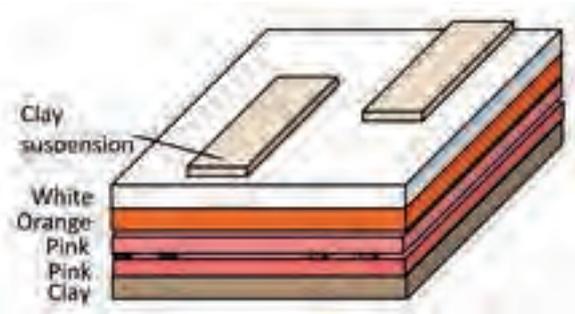
**sample ID**

all layers present: 241

Sample ID 241, thin section in reflected light and transmitted light under crossed polar



**Group 2 – Eastern Buddha**



**sample ID**

all layers present: 203, 204, 206, 208, 219, 220, 223, 230, 234, 245

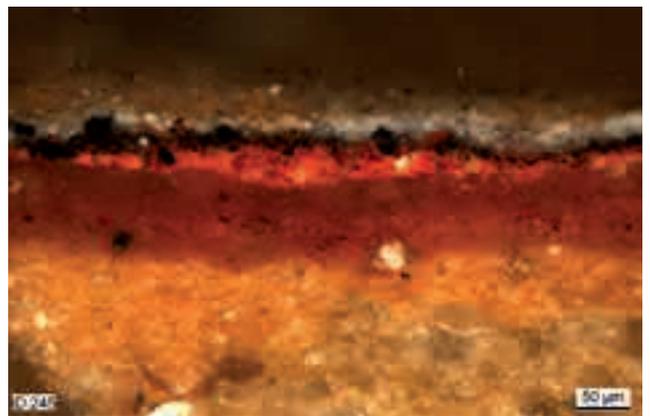
grey on top of white: 238

gypsum on top of white: 243

orange and white in remnants: 190, 199, 201, 233

remnants of pink: 175, 232

Sample ID 245, cross section



### Groups 3 and 4

Groups 3 and 4 comprise all fragments with a brown paint layer as top layer. The visual appearance differs considerably from dark to light, reddish to greyish brown, from smooth to heavily structured or scaly, from matt to glossy. The separation into more than one group was made in the attempt to assemble fragments which look more similar on the overall impression into one group. The closer examination proved that this overall impression often does not correspond to the paint layer sequences. As a kind of compromise between the visual appearance and the layer sequence the separation was made by the number of brown layers: Group 3 contains fragments with two brown layers. Subgroups separate the peculiarly structured, glossy dark brown fragments (fig. 8 top row) from the scaly or smooth and rather matt fragments (fig. 8, lower row). Group 4 comprises fragments with only one brown layer. In both groups traces of red or orange can be found underneath the brown. On the Eastern Buddha the fragments only show one brown layer without red layers underneath.

Independently of the visual impression in colour, gloss and structure, all brown layers share an important property: They are very poor in pigmentation and seem to consist mostly of binding medium. The layers are always semi-transparent and show aging cracks. The degree of gloss, the development of a scaly or wizened surface and maybe even the colour seem to be linked rather to aging phenomena than to deliberate differences made by the craftsmen. Overall, the brown layers appear more like a coating or a glaze, not an application of paint.

### Transition between groups: Group 2–3, 1/2–4, 5–4

The closer examination showed that on the samples of the Western Buddha there is a connection between groups 1 and 2 to groups 3 and 4, because the layer sequence of group 1 or 2 often is found underneath the brown layers. Considering this kind of transition two more groups were formed, named group 2-3 (= transition between group 2 and 3) and group 1/2-4 (transition between group 1 or 2 to group 4). Thin brown layers are also found on blue layers or just on a grey layer which seems to be soot. This connects group 4 also to group 5 (blue).

### Group 5

Group 5 contains all samples with blue paint layers. The blue was underpainted with a dark layer. On the Western Buddha this is a dark grey, on the Eastern Buddha the layer is black and sometimes rather thick. In one sample instead of the blue layer there is a white layer containing single blue particles. Two samples of each Buddha show a white layer underneath the dark grey or black.

The blue is overpainted once, using the same system of dark underpainting and blue. The overpainting mostly appears lighter in colour. Several fragments only show the first or the second layer, indicating that the other one was lost.

### Overlapping layers: Group 1–5

There is one sample from the Eastern Buddha, sample ID 256, on which a transition between a red area (group 1)

Fig. 8. Western Buddha, group 3: Samples with glossy, structured surface (top row), matt surface (middle row) and white below brown (lowest row)



Fig. 9. Layer sequence: Western Buddha, group 3 (left) and group 4 (right)

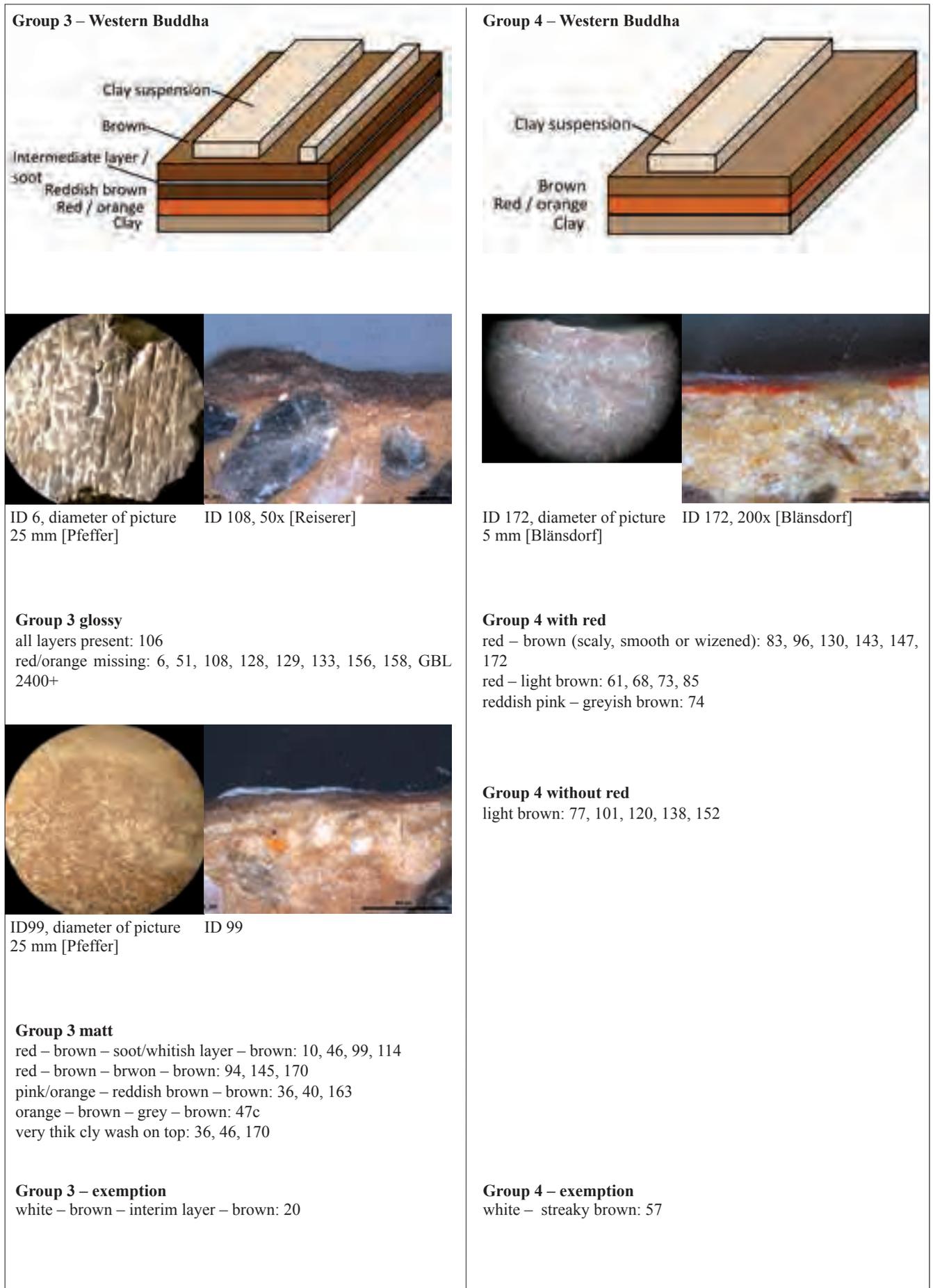
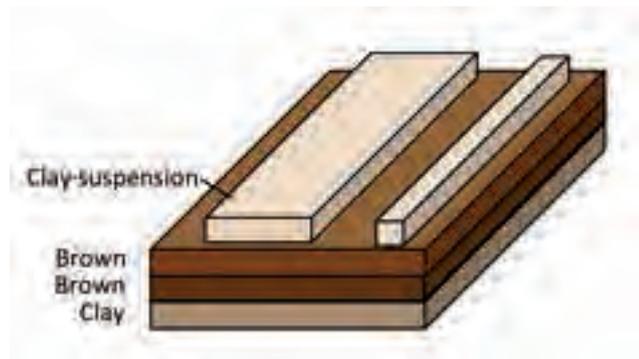


Fig. 10. Layer sequence: Eastern Buddha, group 3 (left) and group 4 (right)

**Group 3 – Eastern Buddha**



**sample ID**

glossy, structured surface: 210  
rather matt, smooth surface: 215, 242, 267

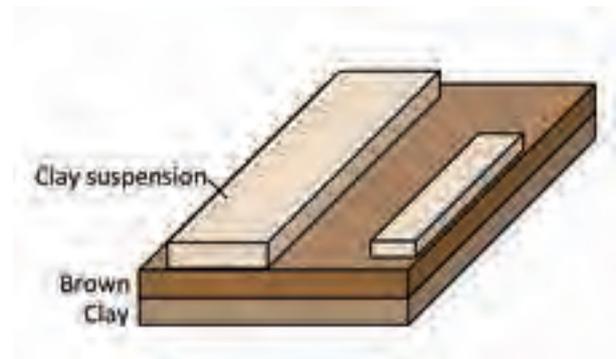


sample ID 267 [Thiemann]

Sample ID 267, cross section, 200 times magnified [Blänsdorf]



**Group 4 – Eastern Buddha**



**sample ID**

smooth: 187, 197, 205, 207, 211, 268  
wizened: 195, 275  
thick clay wash on top: 3, 181

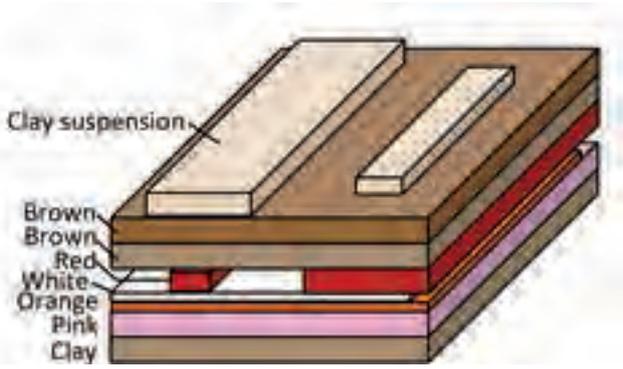
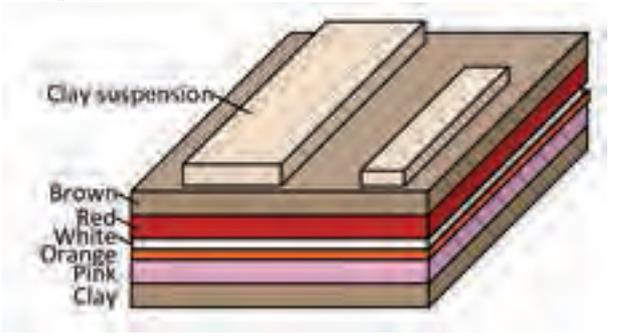
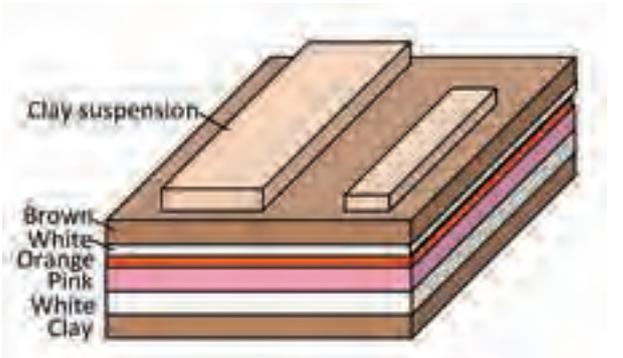


sample ID 275 [Blänsdorf]

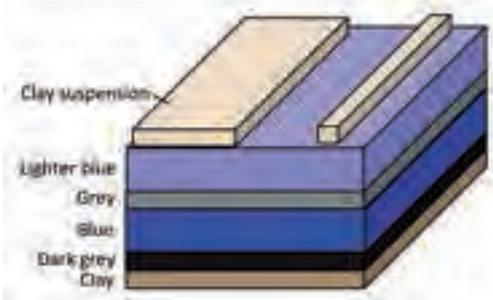
Sample ID 275, diameter of picture 5 mm [Blänsdorf]



Fig. 11. Layer sequence: Transition of groups 1 or 2 to 3 or 4

<p><b>Group 2-3 – Western Buddha</b></p>  <p>Clay suspension</p> <p>Brown Brown Red White Orange Pink Clay</p> <p><b>sample ID</b> white or pink – orange – brown – soot – brown: 19 orange – white – brown – brown: 37, edge 1 red – brown – brown: 37, edge 2 orange – red – brown – brown: 38b pink – orange – brown – brown: 171</p>	<p><b>Group 1/2-4 – Western Buddha</b></p>  <p>Clay suspension</p> <p>Brown Red White Orange Pink Clay</p> <p><b>sample ID</b> group 1 without red – light brown: 47, 38a group 2 – brown: 31 pink – orange – red – brown: 48, 89, 92, 149, 105 (pink) – red – brown: 50, 60 pink – orange – orange – brown: 49 pink – orange – brown: 33 orange – red – brown: 24, 28, 150 orange – dark red – brown: 53 orange – brown: 137, 157 pink – light brown transparent: 75</p>
	<p><b>Group 1/2-4 – Eastern Buddha</b></p>  <p>Clay suspension</p> <p>Brown White Orange Pink White Clay</p> <p><b>sample ID</b> 249</p>
<p><b>Group 5 – 4</b></p> <p><b>Western Buddha</b> white – light blue – soot – light brown: 103</p> <p><b>Eastern Buddha</b> black – light blue – light brown: 193 black – brown: 266</p>	<p><b>Group ? – 4</b></p> <p><b>Western Buddha</b> soot – light brown: 122, 131</p>

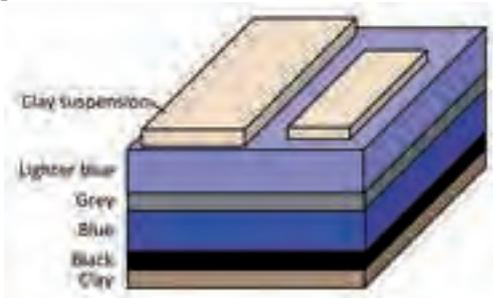
**Group 5 – Western Buddha**



**sample ID**

all layers present: 164  
only first grey-blue layer: 103

**Group 5 – Eastern Buddha**



**sample ID**

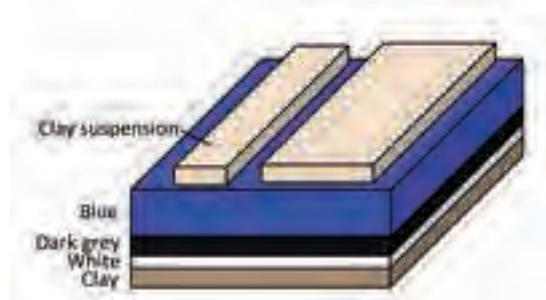
all layers present: 184, 194, 202, 214, 235, 237, 247, 248, 269, 276, 285  
black – blue – grey – (light blue in traces): 212, 221  
black – blue particles – crust: 179, 227, 254, 274  
black – blue: 216, KBL 497  
traces of black and blue: 196, 250  
black – grey crust: 176, 266  
black – white with blue particles: 222  
grey preserved: 217  
grey – light blue: 185, 178, 186, 192, 209, 213, 226, 231, 254, 257, 259  
black: 189, 198, 236



**Western Buddha, sample ID 164, 200x [Blänsdorf]**



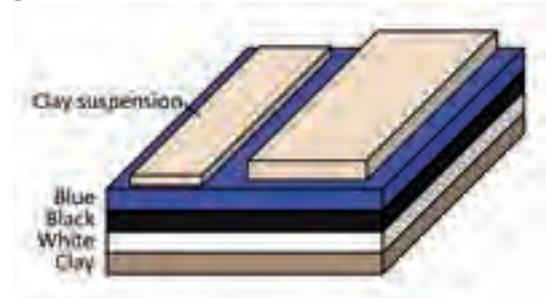
**Group 5 – Western Buddha, first blue with white underneath**



**sample ID**

all layers present: 121, 123

**Group 5 – Eastern Buddha, first blue with white underneath**



**sample ID**

all layers present: 239  
white – black or grey – blue: 262  
white – black – light blue: 196  
white – grey – light blue: 264  
white – light blue: 255



**Eastern Buddha, sample ID 235, 200x [Blänsdorf]**



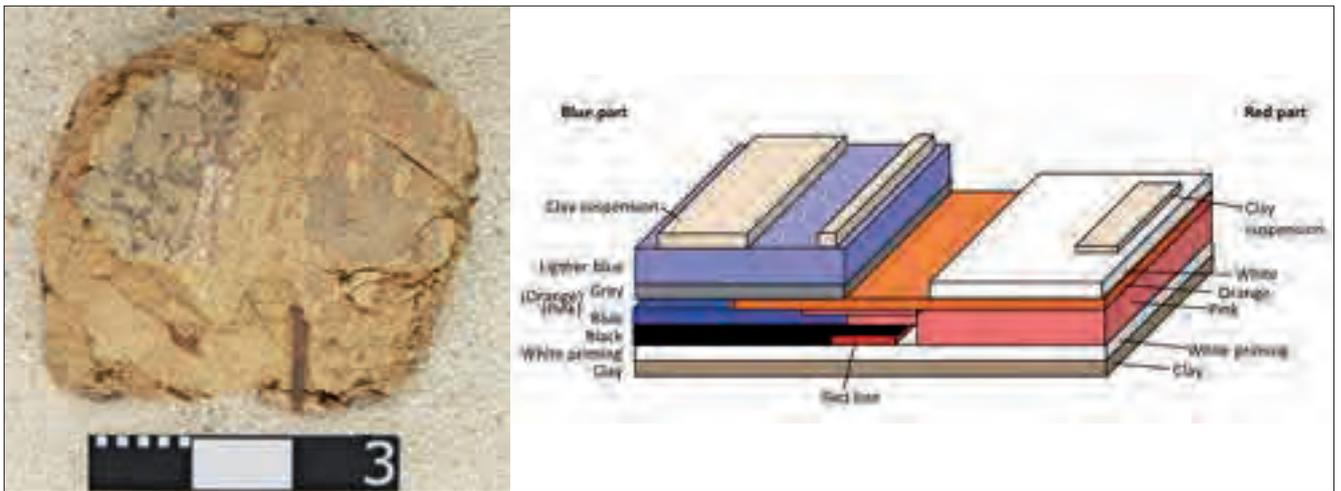


Fig. 13. Layer sequence: Eastern Buddha, transition of blue area (group 5) to red area (group 1)

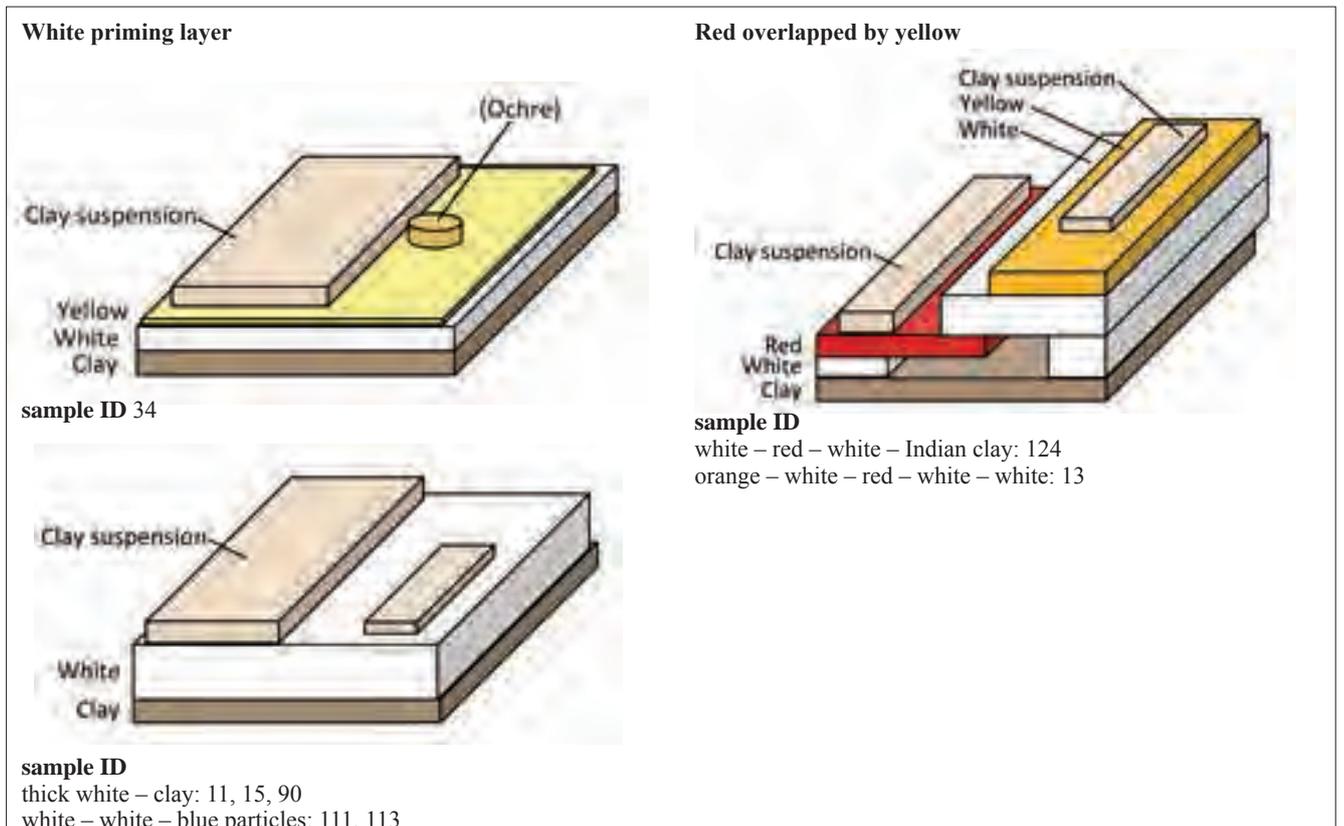
and a blue area (group 5) is preserved. Different from the majority of samples it possesses a white priming layer which covers the whole surface. In the middle there are traces of bright red which seem to stem from a thin line. This line is overlapped from the blue part by the black underpainting and partly the blue. From the red part the pink overlaps the blue. Pink can also be found directly on the clay, where the white is missing. As no cross-section could be made it is not possible to say if there are one or two pink layers. The orange overpainting covers the pink and overlaps the blue. The blue overpainting partly covers the orange which had already discoloured at the surface. The white overpainting

can be found on the orange.

This confusing sounding situation can be interpreted as follows: The red line marked the border between the red and the blue part. The blue part was black and then blue, subsequently the red part was painted pink. In a next phase the red part was overpainted with orange. In a last phase the red part was overpainted in white and the blue part with grey and light blue.

So far, this is the only sample showing this kind of transition. It is not clear if it represents the situation on the whole statue or even both statues. Nevertheless, it is the first and only possibility to understand in which sequence red

Fig. 14. Layer sequence: Western Buddha, group 6



and blue areas were repainted.

*Group 6*

Group 6 comprises different samples with a white priming layer. On top there are yellow or red layers or traces of blue.

These samples are unusual and differ from the other groups in some regards. Only fragments ID 11 and 15 possess animal hair as additive of the clay while in the other fragments there is remarkably little hair (ID 90) or no hair at all. The clay surface appears grey instead of yellowish. ID 11 and 15 possess a rough clay surface, while the others are completely smooth.

The white layer is thick and seems to be a priming layer. In two samples (ID 111 and 113) small circular pits from air bubbles can be seen as they are typical for gesso grounds. Sample ID 13 looks white under the stereo microscope, but the cross section revealed traces of orange, covered by white and traces of red below two thick white layers. Sample ID

124 seems to come from a part where a yellow on a white underpainting overlapped a red on a white priming layer. The thin yellow layer found in sample ID 34 looks rather like a glaze, sometimes even like a patina rather than a paint layer. It is not clear if these fragments belong to the statue of the Western Buddha or come from adjacent parts like the walls of the niche.

Samples ID 244, 251 and 260 look very similar. A streaky red, painted over traces of white, is overlapped by a bright ochre yellow. The ochre was applied on a thick white layer, which also overlaps the red, probably too achieve a brighter colour. Two samples show a similar bright yellow ochre on a white ground. Sample ID 261 shows an additional thick white layer on top of the yellow. The clay layers contain hair and thus correspond to the clay mixture used on the Eastern Buddha.

Sample ID 228 also shows a streaky red. The red overlaps an area of blue possessing a white priming layer and a black

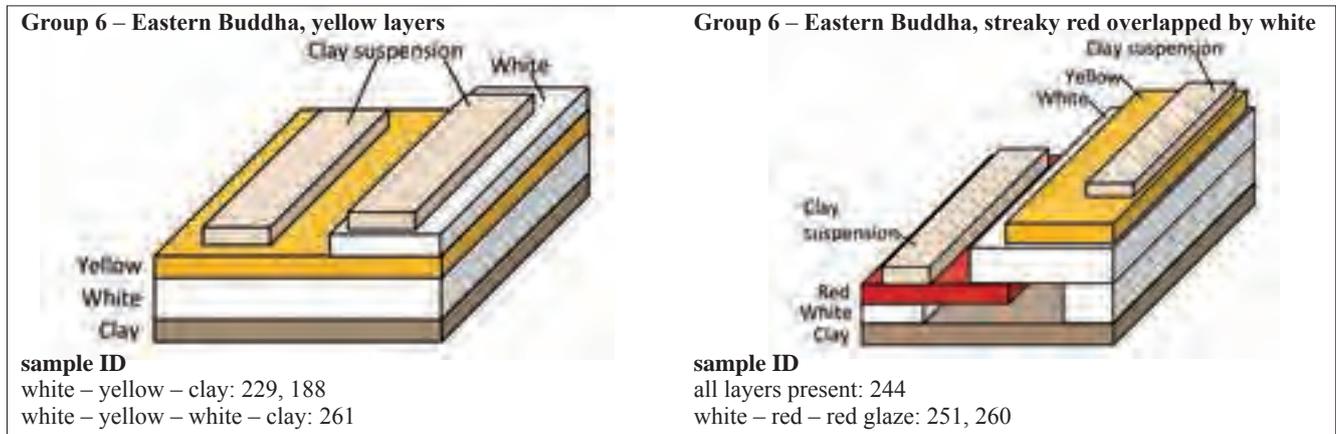
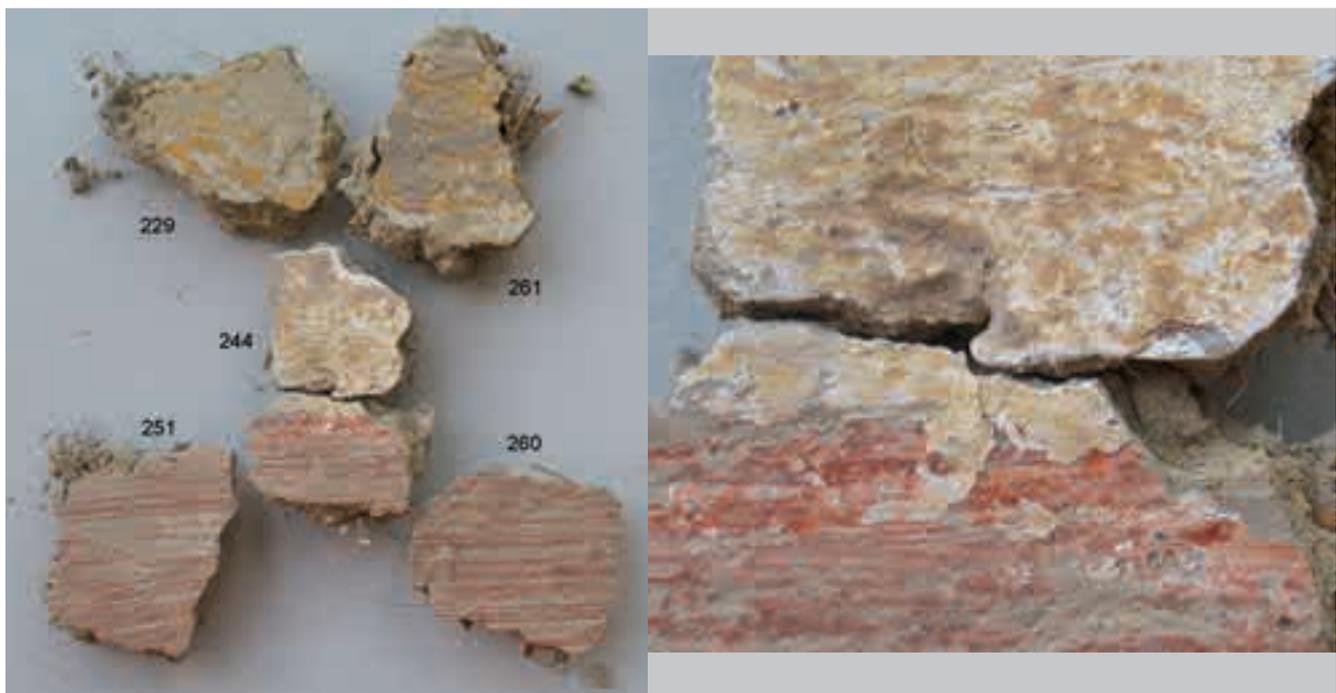
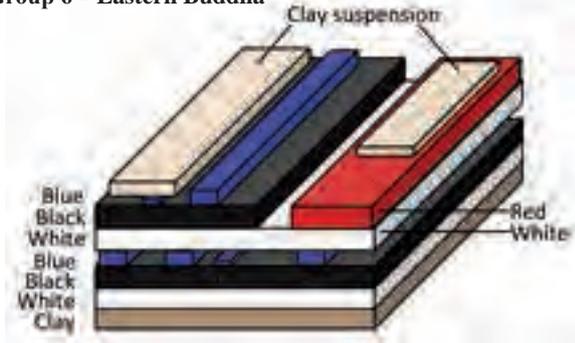


Fig. 15. Layer sequence: Eastern Buddha, group 6, samples with yellow ochre

Fig. 16. Fragments with yellow overlapping red. Sample ID 229, 261 (from KBL 977), 244 (from KBL 517) and 251 (from KBL 620), 260 (from KBL 709) and detail of ID 244 [Blänsdorf]



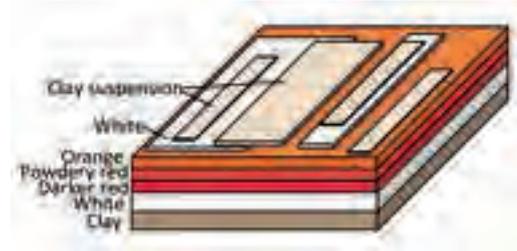
**Group 6 – Eastern Buddha**



sample ID  
228



sample ID  
228



sample ID  
246



sample ID  
246

Fig. 17. Layer sequence: Eastern Buddha, group 6, fragments with red and blue

underpainting. The blue is overpainted with a second blue layer. The red is on the level of the second blue and thus has to be considered as an overpainting. The presence of white layers below and between the blue layers is an exceptional case and does not occur on other fragments.

The fragments were not found together and thus it is not clear if they come from the same area. Fragment KBL 620 from which sample ID 251 was taken was found together with a similar fragment. KBL 621 has a convex shape typical of the fold ridges.

Sample ID 246, from KBL 382, is interesting as it shows two layers different from all the other ones, but as third and fourth layer it possesses the same stratigraphy as the fragments of group 2. On a white ground layer two thin layers of rose red were applied on top of each other. The third layer shows traces of blackened minium, and the last one is the same white layer as in groups 1 and 2. The shape of fragment KBL 382 could indicate that it was part of a fold ridge.

The fact that samples ID 246 and 228 show overpaintings probably means that they were part of the Buddha statue as the murals in the niches apparently were never repainted.

*Samples with several colours*

Three samples from the Western Buddha show two or three colours next to each other (fig. 18). They do not resemble any other samples. Although the clay composition of sample ID 65 corresponds to other fragments of the Western Buddha, it is not entirely sure that the samples come from the statue itself, as the clay contains almost no hair. All samples possess a white priming layer.

Samples ID 65 and 66 show red, blue and white, but nevertheless they do not resemble each other. ID 65 shows a red on traces of a very thin layer of white. The red ends with a straight line and there it is overlapped by a light grey (white mixed with charcoal) and a dark grey (charcoal). Blue particles indicate that at least the dark grey was the underpainting of blue. ID 66 shows a more pinkish red. The blue is applied on top of the red in thin, dry strokes without a layer in between.

Sample ID 93 shows a light gold ochre. Reddish ochre is painted on top as a kind of glaze. The paint layer shows a distinct crack system.



Fig. 18. Fragments with several colours from Western Buddha, samples ID 65, 66 and 93 left to right [Blänsdorf]



Fig. 19. Sample ID 67 from Western Buddha; trace of a 15 mm wide line preserved in the isolation layer (paint layer missing), length of fragment 40 mm



Fig. 20. Fragment KBL 845 with 5 mm wide black line from Eastern Buddha [Melzl]

A sample from fragment KBL 845 of the Eastern Buddha shows a 5 mm wide black line on a light ochre background showing just the isolation layer (fig. 20)<sup>89</sup>. A sample from the Western Buddha, ID 67, also shows a line (fig. 19). It is 15 mm wide and runs straight and with constant width. There is no paint layer preserved on this fragment. The reason why the line is still visible is either that it was drawn with a paint containing a higher amount of binding medium or a diluted ink which penetrated into the clay.

On both samples the clay contains animal hair. They seem to belong to the Buddha statue, but they are the only ones of this kind found so far.

### Identification of pigments

The analyses were mainly performed by polarised light microscopy (PLM).<sup>90</sup> If required, x-ray diffraction (XRD), x-ray fluorescence (XRF) and scanning electron microscopy with element mapping (ESEM) have been used. The pigments identified on the fragments of the groups 1 to 5 are listed in table 2.

### White

The white priming layers (first layer in groups 1, 5 and 6) consist of gypsum and white clay minerals. Mostly the content of gypsum is higher, but the ratios vary.

The white overpainting found on both statues in the samples of groups 1 and 2 consists of a white lead pigment, either lead white or another white lead composition. Anglesite (lead sulphate), laurionite (lead hydroxide chloride) and palmierite (potassium lead sulphate) have been analysed using XRD in a sample of the Eastern Buddha. The use of this with lead pigment is restricted to this second overpainting. One fragment, sample ID 15 has only one white layer which consists of lead white with quartz and therefore probably is a later repair.

### Pink

Pink is mixed of rather fine iron oxides with the same white as that used for the priming layer (gypsum with white earth and calcite). The composition distinguishes the pink paint layer from the pink slurry used before the application of the clay layers, as the slurry contains fine yellow and red

iron oxides, quartz and clay minerals from a natural red earth and varying amounts of calcite, but no gypsum. This differentiation is helpful: Although the two materials differ slightly in colour (the paint layer being more orange, the slurry more greyish), confusion is possible as traces of both are found inside between the clay layers.

The pink layer of sample ID 243 contains grains of starch which could be barley and are probably related to the binder rather than to the pigments of the layer.

### *Red*

The bright orange-red layers are painted with minium, containing some anglesite. The darker red overpainting in groups 1 and 2 consists of iron oxide. PLM preparations show a very pure, brownish red iron oxide, very fine, but often with some larger particles. The red layer underneath the brown (group 3 and 4, Western Buddha) contains very fine red iron oxides. Although some of these layers clearly correspond to the red overpainting of groups 1 and 2, one sample (ID 53) showed darker red particles. With PLM they appeared as fine, pure, bright red iron oxides, often in clusters and with almost no bigger particles.

### *White overpainting*

The thin white layer overpainting the minium consists of a white lead material. Under polarised light the particles resemble lead white, although they are often more rounded than elongated. Few analyses with XRD revealed the presence of anglesite (lead sulphate), plattnerite (dark lead oxide), laureonite (lead hydroxide chloride) and palmierite (potassium lead sulphate), gypsum and clay minerals in the blackened top layer of the minium or the 'sinter crust' covering the blackened minium. The presence of a thin white layer was not recognized at that time. While the plattnerite clearly can be assigned to the blackened minium and the clay minerals and the gypsum to the thin white crust on top of the red overpainting, the other white lead compounds could come from the white layer itself.

### *Blue*

The blue is natural ultramarine. The first blue layer contains many deep blue particles, while the blue overpainting shows a large amount of pale or partly coloured particles and thus probably was of a poorer quality.

The black underpainting contains charcoal black; grey underpaintings consist of charcoal mixed with gypsum. While the underpainting of the first layer is dark grey or even black, the one of the second layer is lighter grey and contains more gypsum and calcite.

### *Brown and 'sinter crust'*

Brown layers contain fine particles of gypsum, few and fine particles of red iron oxides, calcite and white earth. There are only a few and small particles in the layers which seem very high in binding medium. It should be mentioned that the thin white semi-transparent 'sinter crust' which can be found on top of the red overpainting (Western Buddha, groups 1 and 2) contains the same mixture of pigments or fillers. There might be a connection between the brown and the white appearing layers.

### *Samples of group 6*

The samples show the same pigments as were used on the other samples (red iron oxide, ultramarine), but the visible colour is different. The white ground layer contains fine gypsum with some calcite. For the bright pinkish red paint layers in ID 246 (Eastern Buddha) extremely fine dark red iron oxide (particle size mainly below 1 µm) was mixed with very fine ground gypsum. The same fine iron oxide was used in sample ID 65 (Western Buddha), but here some fine minium was added, and there is no addition of white.

Bright yellow areas are only found on these special samples of group 6. They are painted with a very pure, fine and homogenous iron oxide hydroxide with varying ratios of calcite and few white clay minerals.

The overpainting of sample ID 246 consists of blackened minium (layer 3) and white lead pigments (layer 4) and thus is the same as in the corresponding layers of groups 1 and 2. The white on top of the yellow in sample ID 261 consists of gypsum.

### *Discoloration of minium*

A striking phenomenon is the massive discoloration of minium. Almost all minium layers show a black crust. Thin or reduced layers of minium have transformed into black clusters, sometimes forming a crust (fig. 21, centre and bottom).<sup>91</sup> The discoloration seems to have happened only on the parts exposed to the environment, while minium which had penetrated into holes or shrinkage cracks of the clay is still bright orange. The discoloration is found on parts which seem never to have been repainted as well as on overpainted areas. On the few fragments with a double layer of minium, also the first layer has a black surface, which means that this was not a double layer application, but a later repair. Considering the possible time span of repair phases – altogether about 400 years – and the assumption that the blackening would be stopped or reduced when the surface is covered by another layer, the minium must have discoloured within some decades.

Surprisingly, there is also one sample which shows no problems of discoloration of minium (sample ID 62, fig. 21, top). As it seems not to have been repainted after the application of minium, it might have come from a hidden and thus well-protected area.

On cross sections it becomes visible that the orange layer is interspersed with clusters of black particles (fig. 22). An investigation with ESEM proved that the whole layer consists of lead compositions (fig. 23).<sup>92</sup> As components plattnerite PbO<sub>2</sub> (black), scrutinyite PbO<sub>2</sub> (greyish white or dark brown) were identified, next to the white anglesite PbSO<sub>4</sub> (white).<sup>93</sup>

The darkening of minium is a well-known phenomenon caused by the formation of black lead dioxide (PbO<sub>2</sub>, plattnerite and scrutinyite). The conditions or initiating factors of this transformation are not entirely clear. The process can be accelerated by high humidity at high temperatures, but this does not occur in desert regions or dry regions like Bāmiyān. RIEDERER 1977 relates the formation of dark PbO<sub>2</sub> in minium layers from the murals in Kumtura and Kizil, Xinjiang, to the content of massicot in the paint layer, not to the minium itself<sup>94</sup>, while ZOU et al. 1997 interpret lead dioxide as an

Table 2 Pigments identified on the fragments of groups 1 to 5 in Munich 2004–2009 (W. B. = Western Buddha, E. B. = Eastern Buddha)

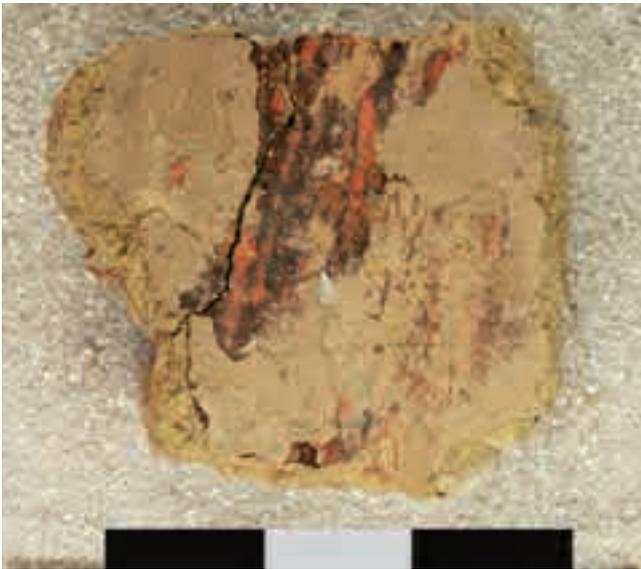
group/analysed fragments	colour (in group)	Western Buddha	colour (in group)	Eastern Buddha	method
1 W. B. 14, 102, 47, 81, 165	white crust	- <u>gypsum</u> , clay minerals - calcite, iron oxides	white + grey XRD	- anglesite (lead sulphate) - plattnerite (dark lead oxide)	XRD
	red (1 and 2)	- <u>red iron oxide</u> , containing maghemite and hematite - some white lead compound - sometimes: gypsum, mica		- laureonite (lead hydroxide chloride) - palmierite (potassium lead sulphate) - gypsum, clay minerals	
E. B. 241	white (1 and 2)	- <u>white lead</u> compound - gypsum, calcite (- iron oxide)	white (1 and 2) PLM	- white lead compound - gypsum, calcite - dark iron oxides	PLM
2 W. B: 4, 52, 54	black surface of orange (1 and 2)	- <u>minium</u> Pb <sub>3</sub> O <sub>4</sub> (orange) - plattnerite PbO <sub>2</sub> (black) - anglesite PbSO <sub>4</sub> (white) - scrutinyite PbO <sub>2</sub> (greyish/ brown) - quartz SiO <sub>2</sub> - kaolinite Al <sub>2</sub> Si <sub>2</sub> O <sub>5</sub> (OH) <sub>4</sub> - dolomite CaMg(CO <sub>3</sub> ) <sub>2</sub>	black surface of orange (2)	- minium Pb <sub>3</sub> O <sub>4</sub> (orange) - darkened particles - white lead composition - calcite	XRD, SEM (W. B.) PLM
	orange (1 and 2)	- <u>minium</u> Pb <sub>3</sub> O <sub>4</sub> - anglesite PbSO <sub>4</sub> and/or lanarkite Pb <sub>2</sub> (SO <sub>4</sub> )O - sometimes: massicot PbO, gypsum CaSO <sub>4</sub> x 2H <sub>2</sub> O	orange (1 and 2)	- <u>minium</u> - white lead compound - calcite	XRD (W. B.) PLM (E. B.)
	pink (1 and 2)	- <u>white clay, iron oxides</u> - calcite	pink (1 and 2)	- <u>white clay, iron oxides</u> - gypsum, calcite	PLM
	white (1)	- <u>white earth, gypsum</u> - quartz, calcite	white (1)	- <u>white earth, gypsum</u> - calcite	PLM
	3 W. B. glossy: 51 matt: 99, 163, 170	white/light brown	- <u>gypsum</u> , clay minerals - charcoal black, calcite, iron oxides	transparent brown	- <u>gypsum</u> , clay minerals, iron oxides, calcite - colonies of bacteria
brownish grey		- <u>gypsum</u> , clay minerals - charcoal black, calcite, iron oxides			
4 W. B. 164	red	- <u>red iron oxide</u>			
	orange	- <u>minium</u> - white lead compound			
	pink	- <u>white clay, iron oxide</u> - calcite			
E. B. 267, 268	blue	- <u>lasurite</u> (particles small, not completely coloured) - calcite, white clay, mica	blue	- <u>lasurite</u> (particles small, not completely coloured) - calcite, white clay, mica	PLM
		grey	- <u>charcoal black</u> - calcite, diopside, iron oxides - colonies of bacteria	grey	- <u>gypsum</u> - charcoal black, calcite iron oxides
	blue	- <u>lasurite</u> (particles small, not completely coloured) - calcite, white clay, mica	white blue	- <u>colonies of bacteria</u> - <u>lasurite</u> (particles small, not completely coloured) - iron oxides	SEM PLM
	dark grey	- <u>charcoal black</u> - <u>white clay, calcium sulphate</u>	black	- charcoal black	PLM XRD
	Indo-Afghan restoration	clay wash	- <u>clay suspension</u> - sometimes gypsum	Indo-Afghan restoration	- <u>clay suspension</u> - sometimes gypsum



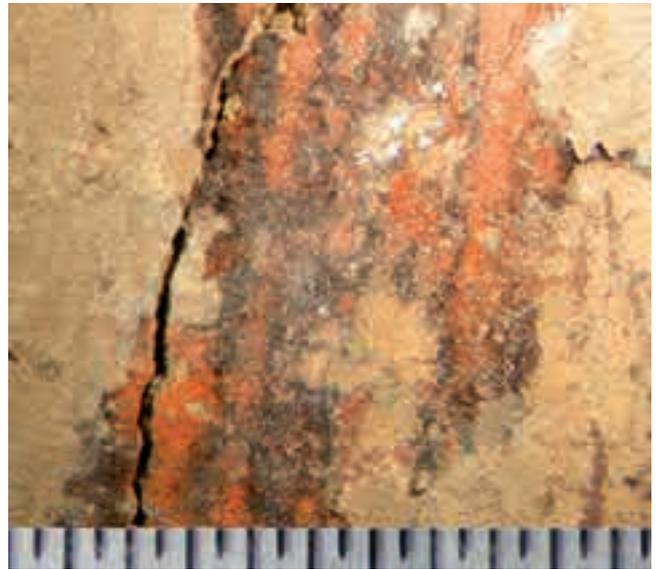
ID 62 of GBL 246



ID 62: Minium without discoloration



ID 59



ID 59: Minium with dark crust

ID 112



ID 112: Minium completely blackened



Fig. 21. Minium discoloured in different extent on three samples of the Western Buddha: The only sample without discoloration (ID 62), discoloured top layer (ID 59), minium completely blackened (ID 112)

oxidation product of minium.<sup>95</sup>

GETTENS 1937/38 remarks that the surface of minium layers on the wall paintings in the Bāmiyān caves has turned slightly brown, but not as brown as often observed in Chinese wall paintings.<sup>96</sup> Minium layers on the Buddha statues, however, often show an extreme blackening. It is possible that this was the reason for repainting these parts.

#### *Bacteria*

Another unusual finding was the presence of small spherical white particles found in white and blue layers (fig. 24, top). In some cases they intersperse the paint layers, but they can form rather coherent thick layers as well. They were also found on a sample from a filling probably made in 1969-78. With polarised light microscopy round particles with a diameter of 2 to 5 µm are visible with refractive index higher than 1.662 and strong interference colours (fig. 24, bottom). An examination with ESEM of a blue paint layer showed the absence of any heavy elements (fig. 24, centre). This led to the conclusion that these 'micro-spheres' are colonies of bacteria.<sup>97</sup> The same 'micro-spheres' have been detected microscopically in other blue samples from both Buddha statues. A thicker white layer on a sample of a reddish plaster completion from the Western Buddha (ID 84) microscopically showed the same spherical particles. Analyses with micro-XRF proved the presence of lead in the completion ID 84; a white layer between two blue layers (Eastern Buddha, ID 235) proved to contain a higher content of potassium, phosphor and calcium than the surrounding (fig. 25).<sup>98</sup>

### Comparison to early Buddhist polychromies on clay support

A comparison to works of art of similar temporal and regional origin, of similar technique and purpose can help to understand the results obtained by the examination of the fragments of the Buddha statues in a larger context. Most important is the comparison to the murals of the caves in Bāmiyān, but a comparison to other Buddhist stone and clay sculptures and wall paintings on clay can be useful as well.

The comparison to pigments found in the murals of the caves in Bāmiyān reveals similarities, but also important differences (table 3). The caves, the construction of which extended over several centuries, show different techniques and materials. They also show yellow, green and black colours which were not present on the fragments in Munich. The blue paint layers in the caves were made with ultramarine underpainted with black. A black underpainting for green was also found in the Bāmiyān caves.<sup>99</sup> Cinnabar and orpiment were used for the murals, but not for the statues. The employment of special techniques may have been restricted to the interior of the caves. The application of oily and resinous binders in some of the caves must have influenced the choice of the colorants as well.<sup>100</sup>

Numerous sculptures from early Buddhist sanctuaries from the Middle East to Western China still exist, many of them made of clay or modelled over a clay core. Very few, however, have been examined carefully. Analyses of materials were not executed or have not been published in Western languages.<sup>102</sup> Investigations into the polychromy of large-size sculptures are missing completely. Descriptions and photographs of polychromy are limited to smaller

Fig. 22. Discoloration of minium: Cross section of fragment ID 166 from GBL 1510-15 (Western Buddha):

- (1) Minium interspersed with black particles
- (2) black layer on top of minium
- (3) overpainting containing iron oxide [Blänsdorf]

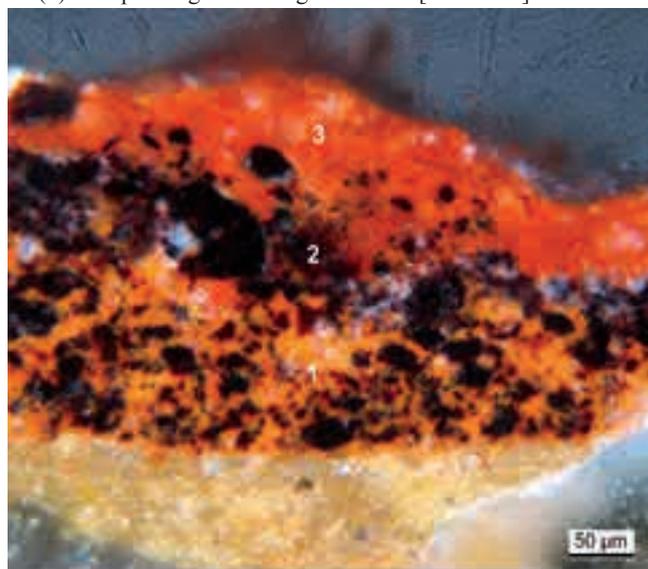
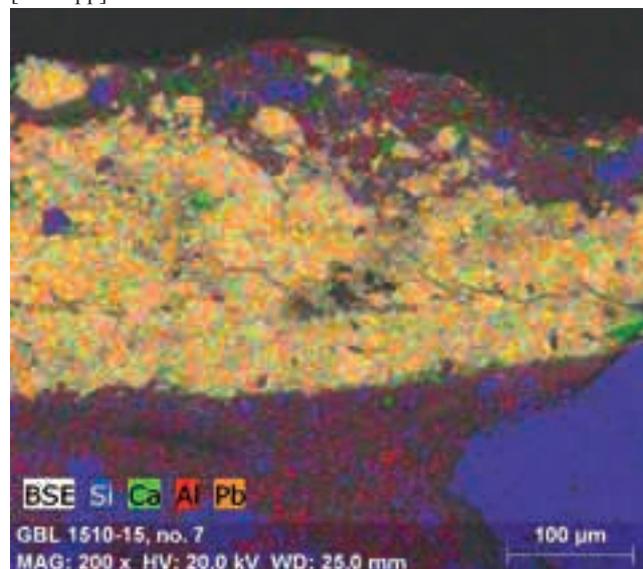


Fig. 23. SEM picture of the cross section with element mapping [K. Rapp]



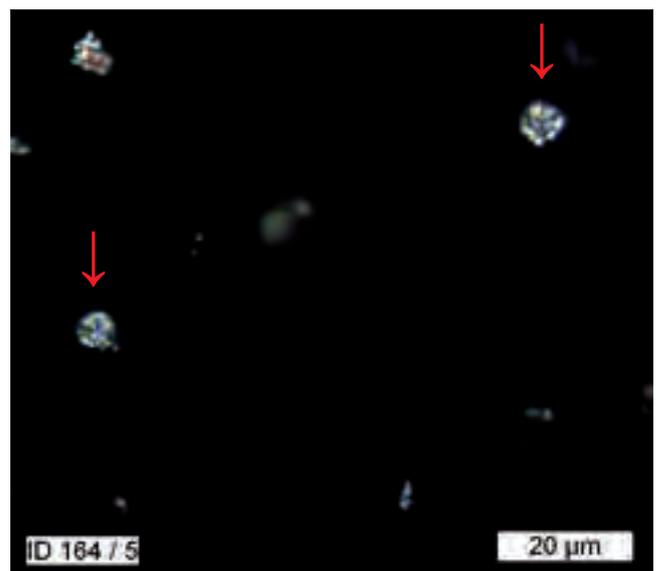
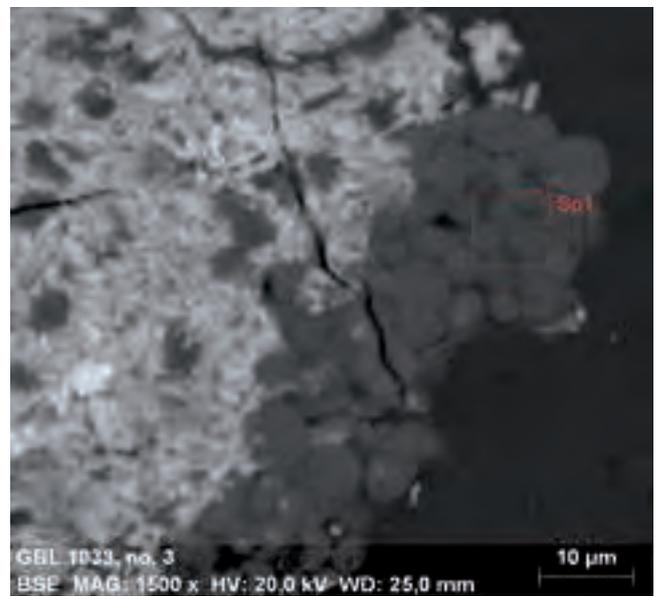
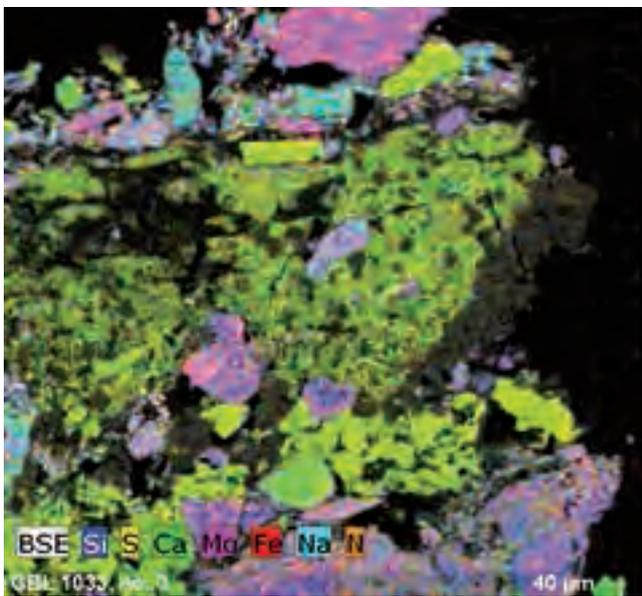
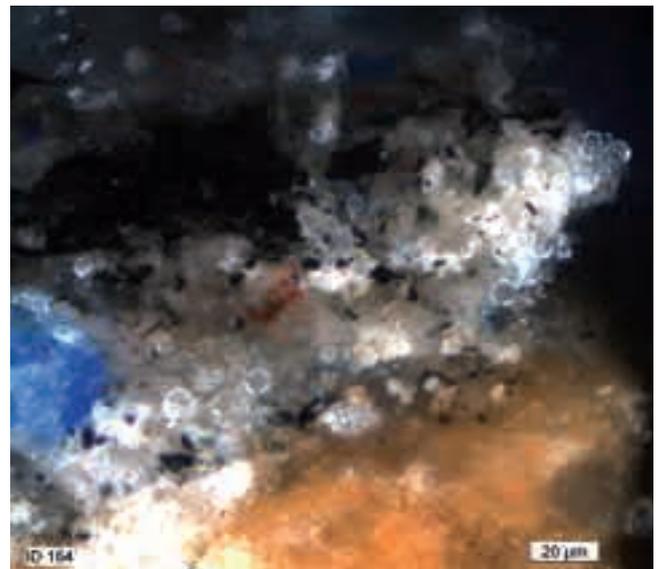


Fig. 24. Micro-organisms inside the first blue paint layer. From top left to bottom right: Sample ID 164 from GBL 1033 (Western Buddha); cross section of fragment; element mapping and SEM picture (BSE); PLM samples of blue layer in transmitted light and under crossed polar (arrows indicating the spherical particles)

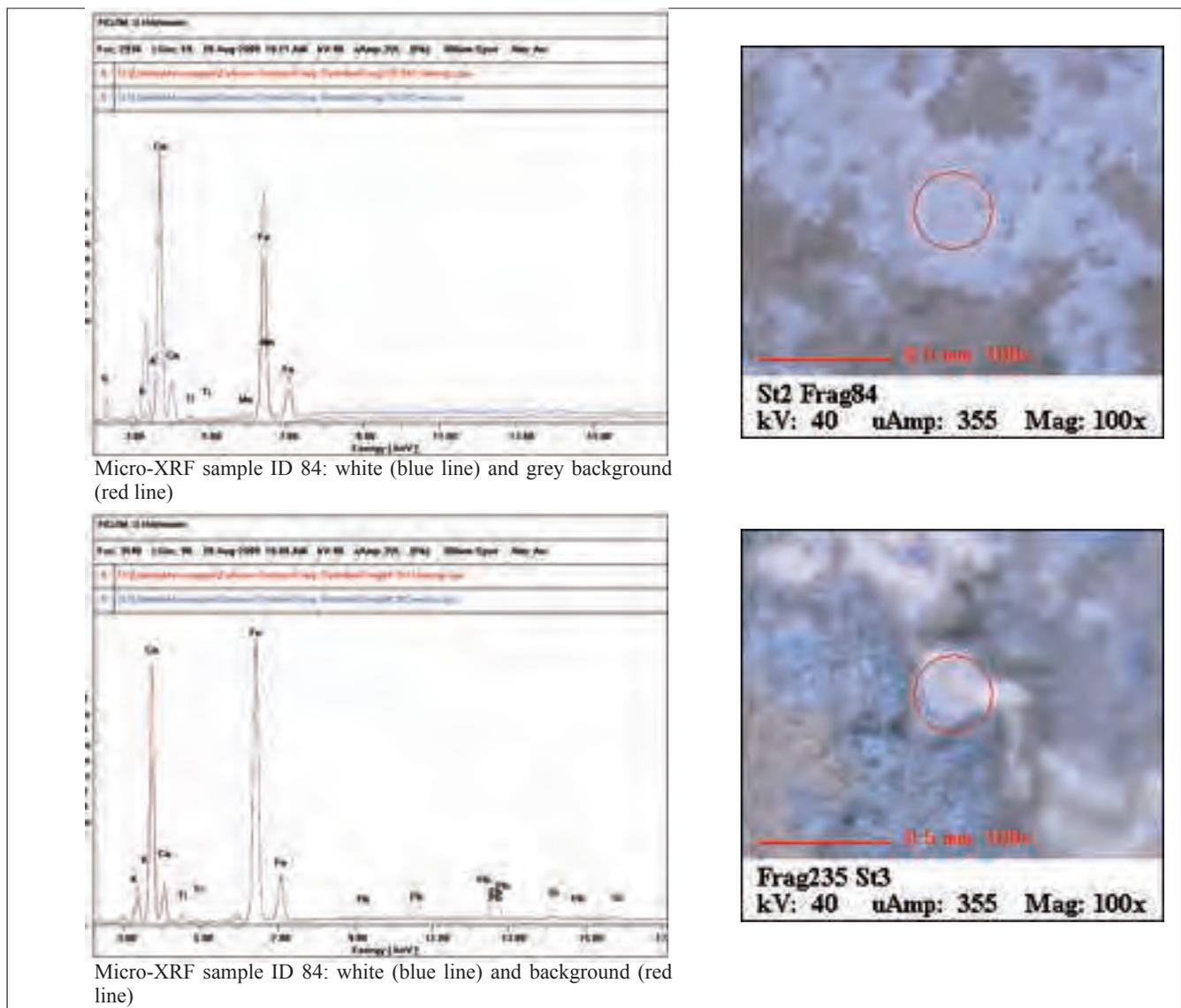


Fig. 25. Analyses of layers containing round white particles with micro-XRF [Hartmann, RGZM]

sculptures. These sculptures have always been indoors, and they required only low amounts of painting material. Both facts may have influenced the choice of the materials as well as the painting technique. The fragments from Nisa (Turkmenistan) are among the few sculptures that were carefully analysed. Their style and the choice of the colorants show a strong Hellenistic (i.e. European) influence, so it is disputable how far they can be regarded as typical of Central Asian sculptures, although they are made of clay. Here the paint layers were applied on a white preparation layer. There are no overpaintings.<sup>103</sup>

More information is available from scientific examinations carried out on wall paintings since the 1930's. Material analyses of Sogdian wall paintings exist for Penjikent (7<sup>th</sup> to 8<sup>th</sup> centuries, Tajikistan) and Afrasiab (6<sup>th</sup> to 7<sup>th</sup> centuries, Uzbekistan)<sup>104</sup>; for Western China as Kucha<sup>105</sup>, of detached wall paintings from Kizil, Kumtura<sup>106</sup> and Miran (Xinjiang)<sup>107</sup>, and the caves of Magao in Dunhuang<sup>108</sup> and Tiantishan in Liangzhou (both Gansu)<sup>109</sup>. Regarding Afghanistan itself, paintings from Sharistan and Kakrak have been examined.<sup>110</sup>

Some results from wall paintings in Ajanta<sup>111</sup> give an insight into the complex Indian techniques. In addition, there is one literal source from India, the *Visnudharmottara-Purana*, written between the 4<sup>th</sup> and 7<sup>th</sup> centuries<sup>112</sup>, which gives some evidence on the painting practise of the early Buddhist paintings.

#### Preparation layers

KAKOULLI 2006 interprets the application of clay plasters as an Asian tradition unknown in Hellenistic murals.<sup>113</sup> Clay plasters and clay-lime plasters as preparation of the walls are described in the *Visnudharmottara-Purana* as well as in later Indian manuscripts. According to these manuscripts, the preparation of the support was finished by the application of a white ground always consisting of calcitic materials like lime or conches. It can be regarded either as the last plaster layer (a pure lime plaster on lime-containing clay plasters) or a white priming layer. It is not clear if the ground layer hardened by setting.<sup>114</sup>

Table 3 Comparison of analyses of the statues and the wall paintings in Bāmiyān

colour	Gettens 1937–1938	Momi/Seke 2006, p. 93–100	Analyses in Munich 2004–2009
	wall painting	wall paintings	statues
white priming layer	burnt white gypsum		
first white layer (priming layer?)			white earth, some gypsum and lead white
white	calcium sulphate	Fe, Ca white pearls: Pb, Ca, Cu	<i>no white</i>
orange	minium		minium
red	iron oxide of different colour, for dark shades addition of charcoal	Hg, Pb, (Fe) >> cinnabar, and minium or lead white	iron oxide, containing maghemite and hematite, some lead white
pink	iron oxide and white (calcium sulphate)		red iron oxides + calcite, lead white, sometimes gypsum
black	charcoal black		<i>black lines not analysed</i>
black below blue	charcoal black		charcoal black + gypsum
blue	ultramarine	ultramarine (?) and another pigment	ultramarine
yellow	ochre [1]	light yellow: As, Fe in Pb (realgar in hydrocerussite)	yellow ochre
brown			white clay minerals + iron oxides
green	- copper containing pigment, but no malachite or Cu-carbonate, maybe chrysocolla (Gettens) - atacamite (chrysocolla), paratacamite [1]	still green: Cu today black: Cu, Fe, Ca	<i>no greens</i>
greenish	mixture of carbon black and yellow ochre		<i>no greenish tinges</i>

[1] This result is reported only in KOSSOLAPOV/KALININA 2006, p. 90.

Most Central Asian wall paintings possess a white ground. This holds also true for the caves and the Buddha niches in Bāmiyān.<sup>115</sup> As materials, gypsum or anhydrite have been identified in the wall paintings of Kizil and Kumtura, gypsum with chalk or magnesium containing chalk in Afrasiab.<sup>116</sup> The white priming on the sculptures of Nisa contains kaolin and gypsum.

Besides white preparation layers wall paintings of Western China also show coloured ones: A pink-coloured plaster layer containing gypsum and iron oxide as finishing on top of a clay layer is described for a wall painting of Miran. In the Mogao grottoes, the top layer over the straw clay plaster consists of a thin white lime wash or a red ochre ground.<sup>117</sup>

The Indian manuscripts also describe underpaintings (*imprimatura*) which were applied completely or partially after sketching the scenery in black or red on the white ground. They are mainly in yellow, but also in other light colours. Such underpaintings have been observed in the wall paintings of Ajanta, too. Black and red contour lines executed before the application of pigment layers could be detected there as well.<sup>118</sup>

#### Pigments

The colours of the examined wall paintings comprise white, orange and red, pink, yellow, brown, blue, green, and black. The palette in total is rather large. It includes (pigments used most often are underlined):

white: gypsum, calcite, lime, kaolin<sup>119</sup>; lead white<sup>120</sup>; lead sulphate<sup>121</sup>  
red: iron oxide, minium, cinnabar<sup>122</sup>  
yellow, brown: ochres, lead pigments (litharge, orpiment), arsenic compositions (orpiment, realgar)<sup>123</sup>, minium + laureonite<sup>124</sup>  
blue: ultramarine, azurite (China), Egyptian Blue, ultramarine (Nisa), indigo<sup>125</sup>, unidentified blue<sup>126</sup>  
green: copper pigments (malachite, chrysocolla ?), man-made atacamite, paratacamite, verdigris<sup>127</sup>; green earth<sup>128</sup>, mixture of orpiment + indigo<sup>129</sup>  
black: bone black, charcoal black, soot/lamp black/Chinese ink<sup>130</sup>  
organic dyestuffs: lilac lake<sup>131</sup>, red lakes<sup>132</sup>; gamboge (yellow), indigo<sup>133</sup>

Regional influences can be especially detected in the choice of blue pigments. Ultramarine, available in Afghanistan in large deposits and excellent quality, is predominant in most Central Asian wall paintings. It was applied on a black underpainting. Additionally, in China azurite was found that is mined in China, and Egyptian blue on the sculptures of Nisa, which reflects Hellenistic influence. At the same time

the presence of ultramarine in Nisa is among the earliest proved uses of lapis lazuli as pigment. This shows once more that the Central Asian painting techniques of the early Buddhist works of art have to be regarded as a fusion of traditions and influences from China in the East, the Roman-Hellenistic sphere in the West and an already well-developed Indian technique.

Decorations with precious metals were known in Central Asia and China. The application of gold leaves and gold powder with animal glue or plant extracts is described in the *Visnudharmottara*.<sup>134</sup> Gold applications such as gold foil and gold powder were found in Tiantishan.<sup>135</sup> A very special technique was discovered in the caves of Bāmiyān: Tin foil was cut in strips and applied as decoration. Coated with a yellow varnish, it gave the impression of gold.<sup>136</sup>

### Interpretation of paint layer investigation

The samples investigated in Munich were selected with great care and meant to comprise the different types of paint layers discernible on the fragments found and stored in Bāmiyān. It is not sure, however, that all types of paint layers were included, inter alia because of the fact that so far the rubble heaps in the niches have not been completely excavated. Thus some types of fragments could still be buried in the rubble. It is clear that the samples do not represent the fragments found in Bāmiyān regarding the frequency of the single colours: At the Eastern Buddha, for example, many reddish fragments have been found which are statistically underrepresented in the samples. The strange brown colours of group 3 and 4, on contrary, are overrepresented regarding the number of fragments found.

There are only few colours: pink to red, blue, brown and ochre. Bright yellow, black and green were not present in the examined samples. White was only found as second overpainting. Compared to paint layers from the murals and works of art of Central Asia, the choice of pigments is rather limited and within the “normal” range. So far, there is no evidence of special decoration techniques as metal foils or gilding of any kind or painted ornaments.

Fortunately, many larger fragments still possess a convex or concave shape which can be attributed to the folds of the garment. As far as it was possible to investigate colours on-site, most of the fold ridges seem to be of reddish colour. As samples were taken from some of them, they can be linked to the samples of groups 1 and 2. The blue fragments of the Eastern Buddha can be assigned to the garment as well and there are two blue fragments of the Western Buddha which also have the shape of fold ridges.

Brown samples come from fragments with flat surfaces and cannot be assigned to any part of the statues yet. The character of the brown is very different from the other colours. While most paint layers are powdery, soft and show a smooth surface, the brown layers are hard and semi-transparent and either glossy with raised brush marks or scaly. The brown seems to be very rich in binder and poor in pigmentation and thus does not really look like a paint layer. As thin layers look light brown, the darker brown might be a result of ageing processes of the binding medium.

The examination showed that at least under most of the brown layers remnants of the red layers can be found. Mostly these remnants are merely tiny traces. This indicates that most of the paint had already flaked off when the brownish material was applied. Two samples were taken from the reddish fold ridge fragment GBL 852: While one sample belongs to group 2, the other is brown with traces of the red paint layers underneath. This proves that the brown was applied on parts of the *sangati* which had been red before.

At least in some parts the brown material was applied twice, with some time lag, as soot was found between the layers. As the brown was also found on top of surfaces completely blackened by soot, this can mean that the brown samples came from lower parts which were blackened by the fire lit in the caves and also more exposed to influences harmful to the paint layer. It should also be mentioned that even some of the Indo-Afghan clay layers possess some kind of brownish glossy patina which must have formed during the past 25 years. The reason or the intention behind the application of the brown layers remains unclear. It cannot even be assumed if the brown was intended to protect or to hide the colours or the surfaces or if it should be assigned to activities quite independent of any reasonable intervention on the statues.

A transition between the different coloured parts could only be found on a single sample (Eastern Buddha, ID 256), showing a red and blue area. As the sample possesses a coherent white priming layer it is not clear if it represents the usual situation of the statue.

All other samples showing more than one colour and an overlapping of different colours (group 6) are so different from all the others that it is not possible to connect them to any other group. It is completely unclear where they come from. The possibility that they were not integral parts of the statues themselves cannot be rejected, although they definitely do not belong to the murals in the caves.

In the end, there are two groups of samples, groups 1-2 and group 5, which can be interpreted as they clearly are part of the garment. In both cases some fragments have a white priming layer, while others do not possess it. In the case of groups 1 and 2 this led to a differentiation into two groups, although the remaining layers show the same sequence. These groups will be discussed in the following:

#### *Priming layer*

The white priming layer raises a problem which cannot be explained satisfyingly yet. The white is found in crevices which could be shrinkage cracks of the clay, and in small holes on the surface, but it rarely seems to be a coherent layer although it is partially applied quite thickly. The pink as the subsequent layer in groups 1-2 has penetrated into crevices and tiny holes of the clay surface indicating that there was no white priming present at that time. Two different explanations are possible:

1. The white priming was not meant to cover the Buddha statues completely. It could have dripped down when the walls of the niches were painted. As colour photographs of the 1970s suggest, they possessed a white priming. Another possibility is that the white priming was applied

only partially on the statues or so irregularly that larger parts were not covered. Compared to other works of art made of clay it seems unusual that there should have been *no* white priming layer, but on the other hand there is no information on comparable large-scale sculptures.

2. The white priming layer belonged to the first polychromy which, except for these tiny remnants, has completely been lost. As it does not seem plausible that the paint layer flaked off completely, this would mean that the paint layer was removed manually before repainting.

### *Pink*

In the samples of groups 1 and 2, the pink paint layer is the first coherent layer we can find. As mentioned before, it often has penetrated into small cavities of the clay surface. This means that obviously it was often applied on the bare clay surface. The pink could be a paint layer, but also a coloured underpainting or priming layer. In China, for example, pale pink often is used as substitute or underpainting of gold on polychrome sculptures. If it was the support of another layer or of decoration, no trace of these seems to have survived.

At the Eastern Buddha there are two pink layers on top of each other, which can be interpreted as a double application or an early repainting with the same material. On sample ID 246, with two red layers on top of each other, it seems to be a repainting as the lower layer possesses a crack system which is filled up by the upper layer. But it is not clear if this sample can be integrated into groups 1 and 2.

### *Overpainting layers of groups 1 and 2*

Both statues show the same layer sequence. The first overpainting was done with minium. Four fragments of the Western Buddha show two minium layers on top of each other. As the first layer is blackened, the second layer has to be interpreted as a repainting. As the second minium layer was found so rarely, it might also have come from a partial repair.

The second overpainting is a rather thin layer of lead white or a white lead compound. It can be assumed that this layer had the function to cover the discoloured minium layer and thus could be interpreted as a priming layer. On the Western Buddha, it was covered with iron oxide red, which seems to confirm the character of a priming layer. On the Eastern Buddha, however, the lead white layer remained the last and thus the visible layer.

### *Blue*

Like the pink layers, the blue mostly does not possess a white priming layer. On the Eastern Buddha the blue is the colour of the lining of the *sangati* and may also be the colour of the undergarment (*uttarasanga*). Although small compared to the outside of the *sangati* (i.e. the largest part of the statues), the blue areas painted with ultramarine were of considerable size. It appears amazing that the precious ultramarine was used in such large areas and in rather thick layers. This is possibly due to the fact that ultramarine is mined in considerable quantities in Afghanistan. Compared

to the good quality of the Afghan ultramarine, the pigment used on the Buddha statues, however, is rather impure and pale.

The blue areas were only repainted once, using ultramarine as well. It is easy to imagine that the blue was spared at one of the repainting phases either because of the price of the pigment or because the respective parts were less exposed and therefore less damaged, or because the damages were less prominent.

### **Conclusion of the examination – the garments of the Buddha statues**

The reddish fragments and the samples of groups 1 and 2 can be assigned to the outside of the *sangati*. The blue was the colour of the lining of the *sangati* at the Eastern Buddha and may have had the same function on the Western Buddha. Starting from this premise, it is possible to get an idea of how the garments of the statues appeared over time. It is not clear if the overpainting was done on both statues at the same time, but it seems striking that exactly the same material was used on both statues. The findings of our investigations allow the reconstruction of different states of their appearance:

#### *First situation*

Both statues may have had a partial white priming or a polychromy that is completely lost.

#### *Second situation*

The outside of the *sangati* was painted pink, the inside blue. The pink could have been the support of another layer or decorations which are lost. The Eastern Buddha possesses two pink layers on top of each other, either as double application or as an early repair, maybe from the time when the Western Buddha was painted.

#### *Third situation*

The pink was overpainted with minium. The *sangati* of both statues now was bright orange. The lining of the *sangati* was still blue. The minium layer of the Western Buddha maybe was partially touched up after some time, as sometimes two minium layers on top of each other can be observed.

#### *Fourth situation*

The *sangati* was overpainted with a white lead pigment, maybe to cover the discoloured minium. On the Western Buddha this white layer was covered with a bright red iron oxide and thus was red again. On the Eastern Buddha, however, no additional layer seems to have been applied or it was lost without leaving any trace. The reasons for that are not clear.

The lining of the *sangati* was repainted with blue, using a poorer quality of ultramarine, mixed with more white. Thus the dark blue areas now appeared a lighter blue.

After this repair the largest part of the Western Buddha, i.e. the *sangati*, was red, while on the Eastern Buddha it was white. This strikingly corresponds to the names of *surkh-but* (Red Buddha) and *khink-but* (Moonwhite Buddha) which can be traced back at least to the 11<sup>th</sup> century.

### *Fifth situation*

Some parts of the statues were covered with a brownish material, containing some soil and a high content of binding material. At that time the paint layers in the respective areas were already quite reduced. The parts overpainted with brown had mostly been red before, some also blue. Others had lost their polychromy completely, but were blackened by soot. At least in some areas the brownish material was applied again after enough time had passed for soot or other residues to settle on the surface.

It should be noted that these overpaintings were carried out in a remarkably short period in view of the effort necessary for repainting such huge statues. All paint layers have to be assigned to the periods of Buddhist predomination, that is

1. between their creation in 540 (Eastern Buddha) or in 580 (Western Buddha) and 770;
2. between 770 and 870 when Bāmiyān was a Buddhist region once more.

Concerning the reasons for the repeated overpainting, it should be pointed out that on many samples the older paint layers had been reduced to mere traces when the next paint layer was applied. This indicates that at least in more exposed parts the paint layers did not last very long. Additionally, the discoloration of the minium may have resulted in a very unpleasant change of the visual appearance.

For obvious reasons, at least the last overpainting (lead white/red iron oxide) should be attributed to the second Buddhist period, as damages must have occurred during one hundred years of neglect and perhaps also vandalism, and consequently may have been repaired. Showing this last version of colour distribution, the two statues became the 'Red idol' and the 'White idol' on account of their overall appearance.

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