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Recording the Consolidation Treatment of Damp Amber Beads Excavated in 2003 and 2004 from Barrow Clump, Wiltshire

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Summary

Two consolidants have been evaluated to consolidate the damp and fragile amber beads from the A/S graves at Barrow Clump, Wilts. The choices of solvents and consolidants have to be selected with consideration as they can cause irreversible damage to the amber; and Paraloid B67 in white spirit produced the best results. Primal WS 24 was also tested and produced fairly good results, but was more appropriate for consolidating wet beads that could not be dried first without damage.

Keywords

Conservation
Early Medieval
Amber

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Contents

Introduction

The Barrow Clump excavation produced a collection of damp amber beads. The site consists of severely badger damaged round barrows within the chalk landscapes of Avebury and Stonehenge, in Wiltshire. The beads are from Saxon graves that were inserted in the Bronze Age barrows. The present condition of the beads suggests that they require consolidating if they are not to break into pieces in storage and with handling. This report focuses on the consolidation work of the amber beads and presents the materials and methodology, as well as discusses the related issues.

Condition of the beads

The amber beads were stored at 4ºC in a cold room since excavation in order to retain the moisture, and maintain a stable micro environment. A brief condition assessment has shown that the beads are still losing moisture, and they require conservation treatment to stabilize them and prepare them for study.

The dimensions and condition of the amber beads are listed in Appendix 1. The beads have two different forms of deterioration, surface crazing and powdering (Figure 1), and deep cracks in the core of the beads (Figure 2). The former happens in a relatively short time, and will cause dramatic surface loss. The latter are common in amber artefacts due to long term oxidation, and the growth of the cracks will eventually break the object into pieces. The consolidation should aim to strengthening both the surface and body of the amber beads, to arrest both forms of deterioration.

Figure 1. The surface crazing causes material loss (No. 200434967)

Figure 2. The cracks in amber become visible when light penetrates the bead (No. 200434975)

Methodology

The main issue in this project is whether to consolidate the beads in their present damp condition or after they have been dried. Given that there will be more choices of consolidants in dry circumstances, the beads would preferably be dried before consolidation, and the method proposal would follow the procedure, which is explained clearly in Figure 3:

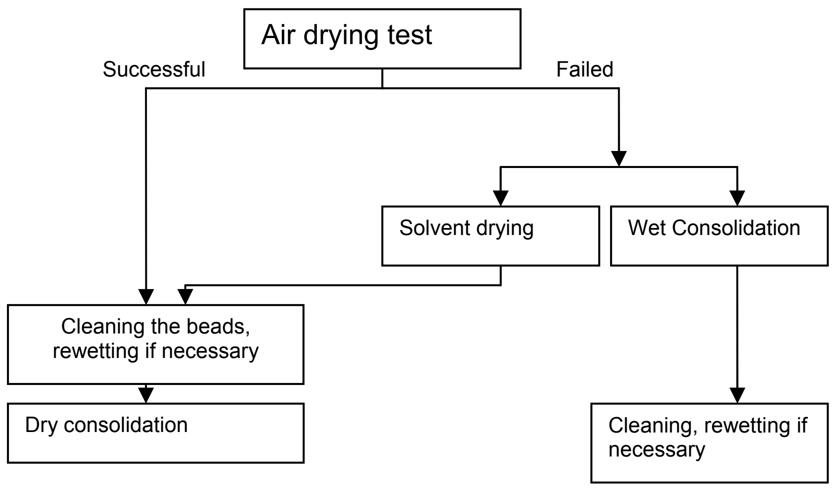

Figure 3. The proposed procedure of treatment methods on the amber beads.

Air drying
Some objects may be safely dried in the ambient condition depending on the materials, the moisture content, and the relative humidity in the atmosphere. Because these beads were only in a slightly damp condition, which suggests a relatively low moisture content, there is every possibility that the beads could be safely air dried.

Solvent drying
The solvent drying has been widely used for waterlogged materials, such as ceramics, glass and wood, using acetone or Industrial Methylated Spirits (IMS). By immersing the objects in a bath of water and solvent mixture, and by increasing the ratio of the solvent, the water in the objects is gradually exchanged with the corresponding solvent until all the water is replaced with the solvent (Panter 1987). The objects are then dried out either in the ambient condition of the laboratory or in a solvent atmosphere. Acetone is more effective than other solvents for dewatering waterlogged amber (Payton 1987).

Choices of consolidants
Being a fossil resin, ambers are susceptible to many solvents. The higher the polarity of the solvent, the more effect the solvent will have on the amber. Thus alcohol is more likely to affect amber than other commonly used solvents. Ambers are often valuable materials for authentication and provenancing studies; the consolidants and solvents introduced therefore should not interfere with any of the analysis. Thickett has discussed the influences of solvents on the analysis of amber (Thickett 1993), and he has studied the effects of several consolidants on amber by

presenting the consolidation work on two amber objects in the British Museum (Thickett 1995).

Paraloid B67 (Butyl methacrylate) has been shown to have very little affect on the infrared spectrum of amber (Thickett 1995), and its good solubility in white spirit makes it highly suitable for amber consolidation since white spirit has been found to have little effect on amber itself (Thickett 1993). Being an acrylic polymer, Paraloid B67 has very good aging properties, even though it tends to crosslink during degradation, which usually reduces its solubility. A low concentration solution of Paraloid B67 in white spirit can be applied either locally with a pipette or by partial immersion.

Water based adhesive systems, such as acrylic emulsions and colloidal dispersions, are suitable for consolidating damp materials. Studies have concluded that acrylic colloidal dispersions are more suitable for the consolidation of a range of organic materials than emulsions due to the smaller particle size and lower viscosity which enable better penetration (Koob 1981). There is a variety of acrylic colloidal dispersions with various properties, and Primal WS 24 was chosen in this project as a candidate because it has an appropriate glass transition temperature of 39ºC and a PH of 7.4 (Robert 1984).

Experiments

Air drying

The amber bead (No. 200434970), which was exposed to air for a week, had shown a little weight loss (maximum 1%), and the weight fluctuated during the day probably corresponding to the fluctuation of the relative humidity (RH) in the laboratory. There was no visual change observed under the microscope, but it did dry and become slightly brittle. The crazing surface was loose, which suggested that the RH fluctuation in the environment in future would affect the stability of the amber beads. The air drying test seemed successful, which suggested that the beads can be rewetted during cleaning if necessary.

Cleaning

Many of the beads have surface accretions comprising soil including chalk particles and rootlets. Rewetted locally with distilled water applied with micro pipette, accretions could be removed without noticeable damage to the surfaces of the beads (Figure 4).

Figure 4. The process of cleaning with rewetting the accretion. Left: the accretion, Middle: the accretion wetted, Right: the accretion removed. (No. 200434974)

Consolidation with Primal WS 24
Primal WS 24, as a 5% solution in water, was tested as a consolidant on a bead fragment (No. 200434487). The bead fragment was partially immersed in the liquid over night because the water based system penetrated rather slowly. After it dried out, the fragment was examined under a microscope, and it was noticeable that the surface had become quite shiny, and the consolidant appeared to have formed in the surface layer due to the evaporation of the water.

Consolidation with Paraloid B67
Paraloid B67, as a 5% solution in white spirit, was tested on another fragment (No. 200304541). The liquid wetted the sample instantly, and the cracks in the amber body disappeared because they were filled with liquid (Figure 5). The sample was partially immersed for 10 minutes, and it took more than a day to dry out. The consolidant had distributed quite evenly in the whole surface layer, and presumably had in the body as well. Compared to the sample treated with Primal, the surface was less shiny, therefore more acceptable (Figure 6). Paraloid B67, 5% in white spirit, was chosen to be the consolidant for its good penetration, even distribution and fine surface appearance. It was decided to apply the consolidant locally rather than by immersion, because the immersion method tested had caused some fragile surface loss (Figure 7).

Figure 5. Amber bread fragment (No.200304541). The cracks disappeared suggesting the liquid had filled them. Right: the fragment is wetted with Paraloid B67 in white spirit.

Figure 6. Amber bead fragments.The comparison of the surfaces consolidated with different consolidants.
Left: Primal WS 24 on bead No. 200304487
Right: Paraloid B67 on bead No. 200304541

Figure 7. Amber bead (No. 200434974). The surface loss caused by immersion treatment

Conclusion

All the beads, apart from the fragments, were treated with Paraloid B67, 5% in white spirit. The consolidant was applied with a capillary micro pipette about 3 to 4 times on each bead, and another application was given to some beads after they had completely dried over several days. The beads were observed by eye and under a microscope after consolidation, and the surfaces of the beads only appeared slightly shiny from some angles in the light, which suggested the existence of a consolidant film. The colour of the beads became darker after consolidation, in that the gaps and cracks in the amber had been filled with consolidant, which had partially restored the original colour. The colour remains natural and acceptable, and the physical condition of the beads has been strengthened.

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Appendix 1: Condition of the amber beads

Appendix 1. Table of condition of amber beads

Lab No.	**Context**	**Dimensions** (mm)			**Condition**
		Diameter (max)	Diameter of the hole (max)	Thickness	
200304406	2147	9.18	2.00	7.33	Good condition, tiny surface loss and dirt
200304407	2147	8.79	2.09	9.00	Dirty, small areas of surface loss
200304409	2147	12.51	5.47	2.20-8.72	Large areas surface loss
200304410	2147	12.40	3.52	3.97-6.34	Dirty, large areas of surface crazing
200304411	2147	14.15	4.09	7.90	Dirty, small areas surface loss, abraded
200304412	2147	20.73	2.73	3.60	Small areas surface crazing
200304413	2147	20.28	2.69	9.24	Large areas of cracking, surface crazing, loss
200304420	2147	18.34	3.61	2.82-6.04	Dirty, overall surface powdering, loss, cracks
200304421	2147	-----	------	------	fragment
200304422	2147	19.57	3.71	9.39	Dirty, surface powdering, cracks
200304423	2147	7.22	1.70	8.17	Overall surface powdering, crazing
200304425	2147	8.07	2.59	8.26	Overall surface crazing, pits
200304429	2147	------	------	------	Small areas of surface crazing, a bit dirty
200304487	2192	9.97	1.50	10.02	Several fragments
200304505	2192	6.04	1.45	5.41	Dirty, large surface loss, long cracks
200304522	2192	------	------	------	Fragment
200304541	2192	------	------	------	Fragment
200304546	2192	------	------	------	Small chips
200435010	2457	8.19	1.70	7.39	Dirty, large areas surface crazing
200435052	2457	7.12	1.72	6.18	Dirty, large areas surface crazing
200434952	2457	20.54	3.31	5.13-8.86	Good condition, dirty
200434966	2457	20.68	3.78	1.50-7.13	Good condition, a bit dirty
200434967	2457	10.92	2.28	9.58	Overall crazing, large surface loss
200434970	2457	11.54	2.57	12.00	Large areas surface crazing, a bit dirty
200434971	2457	18.32	3.55	3.55-11.63	Dirty, abraded surface

Table of condition of amber beads continued

Lab No.	Context	Dimensions (mm)			Condition
		Diameter (max)	Diameter of the hole (max)	Thickness	
200434973	**2457**	**11.68**	**2.21**	**11.27**	**Dirty, large areas crazing, tiny loss**
200434975	2457	6.74	2.20	3.81-6.14	Dirty, surface powdering
200434976	2457	14.48	1.79	3.32-6.50	Dirty, surface powdering
200435028	2379	22.00	3.00	5.08	Dirty, surface crazing
200434974	2457	20.69	2.88	2.29-6.69	Dirty, surface crazing

Appendix 2: Amber beads before consolidation

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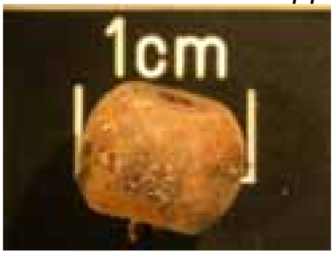
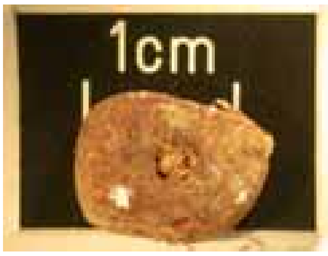


200304406

200304407



200304409


200304410


200304411


200304412


200304413


200304420

200304421


200304422


200304423

200304425

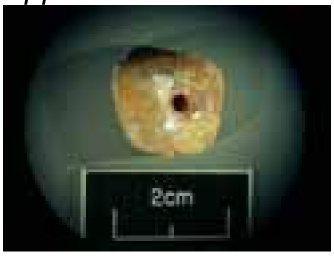
200304429


200304487


200304505


200304522

Appendix 2 continued



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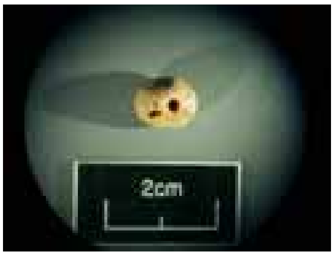
200434966



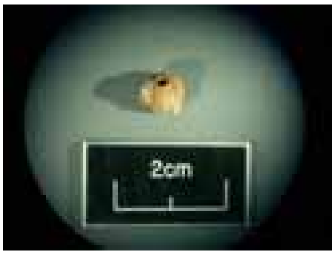
200434967

200434970

200434971

200434973

200434974



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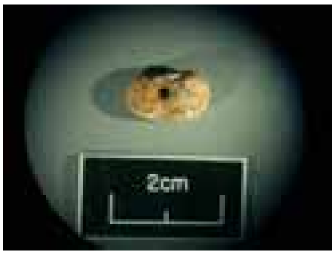

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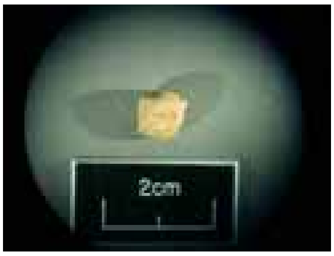
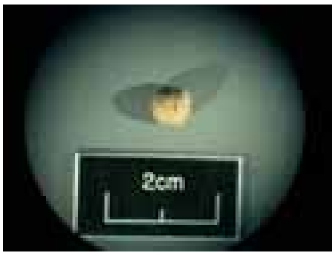


200435010



200435052

200435028

Appendix 3: Amber beads after consolidation

Appendix 3. Amber beads after consolidation

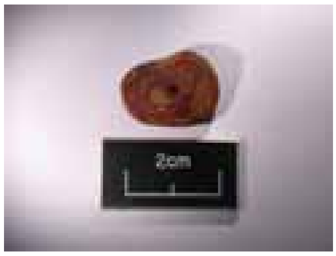
200304406

200304407

200304409

200304410

200304411



200304412

200304413

200304420

200304422

200304423

200304425

200304429

200304487

200304505

200304522

200304541

Appendix 3. Continued

200434952

200434966

200434971

200434973

200434974

200434975

200434976

200435010

200435028

200435052

200434967

200434970