The application of Cyclododecane (CDD) for lifting fragile lacquer fragments from burial environments

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Introduction

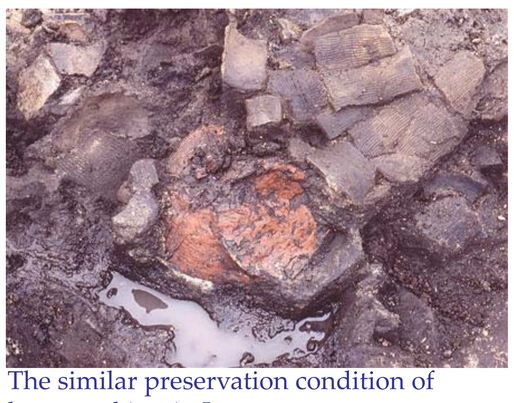
Lacquer wares (commonly of wooden fabric) from burial sites especially in northern China are seldom preserved, owing to underground water seasonal fluctuations and other unfavorable conditions such as soil chemistry.

Two lacquer ware remains found in a Western Zhou (1046-770 BC) tomb, Liangdaicun Archaeological Site, Shaanxi Province, China, 2006

www.wenwu.gov.cn/ShowArticle.aspx?ArticleID=2956

Poorly preserved lacquer objects in Hubei Province, Southern China.

www.people.com.cn/.../74/2002/223/893890.html



The similar preservation condition of lacquer object in Japan.
www.sankei.jp.msn.com/.../acd0712200803002-n1.htm

Objective

This project explores different approaches on application of CDD and intervention materials that would enable conservators and archaeologists to safely lift the fragile lacquer fragments without causing further mechanical damages, while keeping humidity constant, thus preventing the shrinkage of the lacquer.

Experimental Procedure and results I

Simulation of excavation site

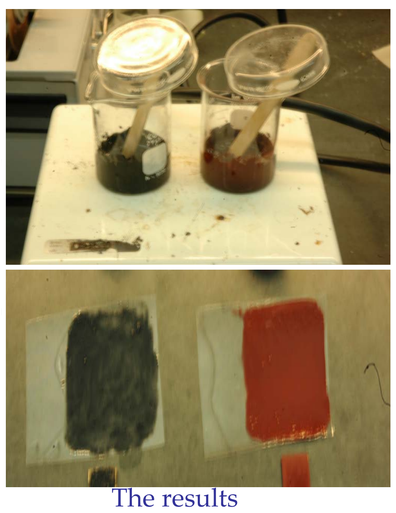
Create similar burial environment and fragile lacquer pieces: Dammar gum was melted with pigments and was brushed on Mylar to create synthetic lacquer; Earth was prepared as ground.

Fragile lacquer fragments

Dammar gum: tree gum
Melting point: 100˚C-150˚C
Solubility: Soluble in turpentine and mineral sprits

Melted + Red/Black Pigments

Brush them on Mylar and dry

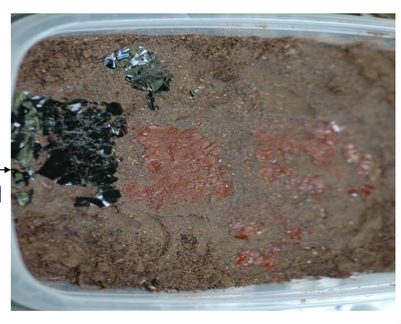


The results

Excavation site

Wet soil

Press the coated Mylar and stick the coating on soil

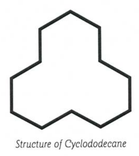


The results

Experimental Procedures and Results II

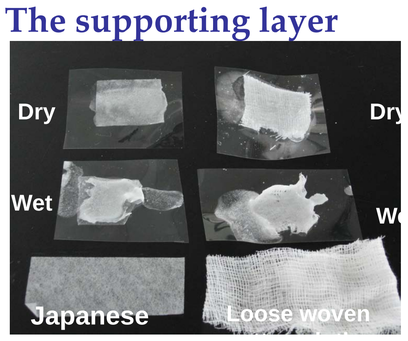
The use of CDD: Application methodology and supporting layers.

Molten CDD and CDD in solvents were tested. CDD in solvents dissolved the synthetic lacquer and were ruled out at the end. Japanese tissue and loose woven cotton cloth were tested as supporting materials both in dry and wet states. Wet Japanese tissue can not combine with CDD and was ruled out.



CDD: A cyclic hydrocarbon(C12H24),
Volatile waxy solids.
Melting point: 58-61℃
Soluble in Non-polar solvents

The supporting layer



Tests on the compatibility of Japanese tissue and loose woven cotton cloth with molten Cyclododecane

Molten CDD was brushed on dry and wet loose woven cotton cloth and dry Japanese tissue

Dry loose woven cotton cloth

Wet loose woven cotton cloth

Lifting

Lifting

Conclusion

Effectiveness of Treatment

The wet loose woven cotton cloth with molten CDD showed the best result.

Molten CDD (Lab environment: RH 40.5%, T71.5°F(22˚C))				
Carrier	Wet	Dry	Effectiveness of lifting	Recommendation Use
Loose woven cotton cloth	✓		Good; No cracking and surface alteration	✓
		✓	Fair; Small shrinkage occurred	
Japanese tissue	✓		Fail; No cohesion between JT and CDD	
		✓	Fair; Separation between JT and CDD occurred during lifting	

Future work

1. To assess total clearance of CDD and micro-morphological and structural alterations of the lacquer by using FTIR and SEM-EDS.
2. *In-situ* testing on original fragments.
3. Investigate storage and display alternatives for the lacquer fragments.

Acknowledgements

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