The use of adhesive bonding technology in the conservation and restoration of a faience basin

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Abstract

The restoration of broken and fragmented ceramic artefacts is integral to their conservation process. Historically, techniques like riveting, used in Europe until the mid-19th century, were common, albeit detrimental to aesthetics and structural integrity. Modern advancements in polymer adhesives have revolutionized restoration practices, allowing for improved results. This study details the restoration of an 18th-century faience basin from the Miragaia factory, fractured into 17 pieces and previously held together by 15 staples (or rivets). Through meticulous removal of rivets, filler, and aged paint, followed by cleaning of the surfaces and bonding with Paraloid B72 acrylic resin. This polymer material is a thermoplastic that is appreciated due to its reversibility, mechanical properties, and ease use. Particularly, its reversibility is very important since the repair must be reversible, and the observer must be able to recognize repaired components in the current restoration ethic.

Stages of restoration

State of conservation

The faience basin was fractured into seventeen fragments and had fifteen heavily oxidised iron staples. It also showed traces of previous restoration, as can be observed in Figure 1, with filler on the noble side and greasy paint over preparation on the back.

Figure 1 – State of conservation of the faience basin prior to restoration.

Staples extraction and dismantling of the fragments

Initially, the oxidized iron staples securing the fractured basin were carefully removed. Attention was given to minimizing damage during staple removal to preserve the ceramic surface. The fragments were disassembled, with the most misaligned pieces disassembled through slight pressure on the joints, as shown in Figure 2.

Figure 2 – Oxidized iron staples (left) and basin partially dismantled (right).

Mechanical and chemical cleaning

Precision tools such as a binocular loupe and scalpel were utilized for meticulous cleaning of fragments. Additional mechanical cleaning was performed targeting persistent debris and residues. The bigger fragments underwent thorough cleaning using Synperonic™ cleaning agent and tepid water, followed by continuous mechanical cleaning aided by acetone for difficult residue removal.

The other fragments were cleaned after being immersed in water at 45°C. Figure 3 (left) depicts the fragments after cleaning, as well as a detail of a cleaned fragment (right). In the image on the right, it is possible to observe a detail of cleaned holes where previously oxidizes staples were attached.

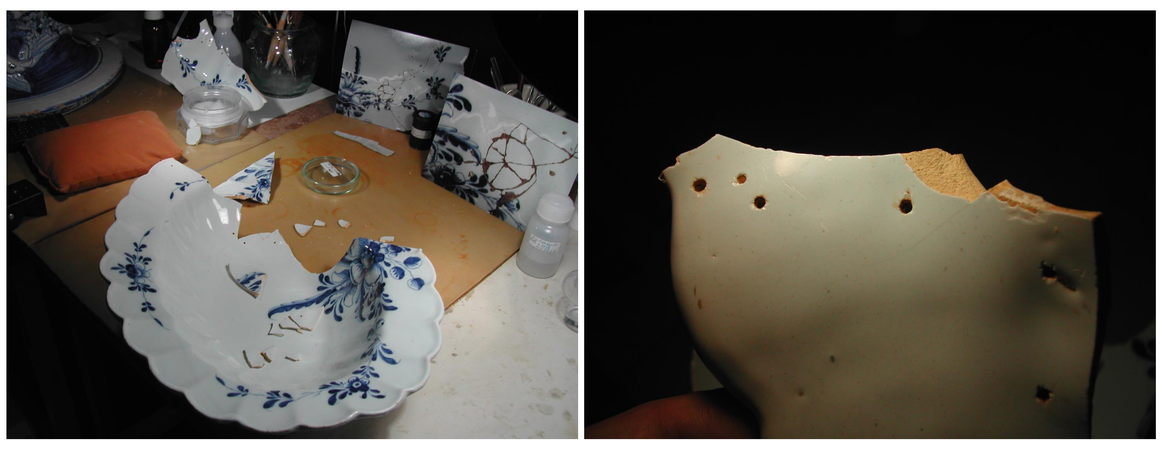

Figure 3 – All fragments cleaned and ready to be assembled (left) and detail of a cleaned fragment (right).

Sealing and assembly of the fragments

Fragments were sealed and bonded using Paraloid B72 in acetone, ensuring compatibility and durability in the restoration process. Each fragment was meticulously checked for cleanliness under a magnifying loupe before its assembly. The assembly process is showed in Figure 4.

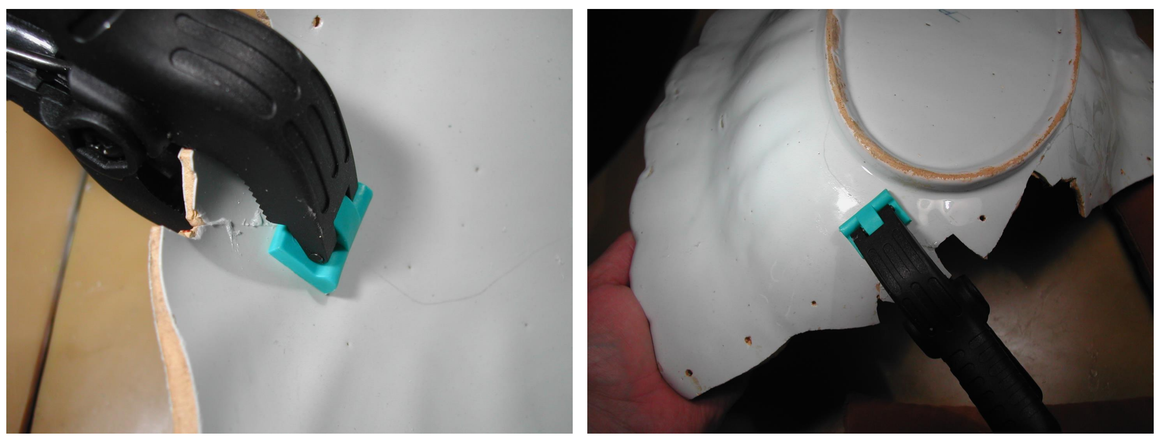

Figure 4 – Details of the bonding process resorting to clamps to ensure the correct assembly of the fragments.

Filling and refinement

Gaps and imperfections were filled with Paraloid B72 in ethanol, mixed with silica, kaolin, and pigments for a seamless finish. Additional layers of pigmented Paraloid B72 were applied, followed by polishing of the surface.

Final touches and surface refinement

The restoration process concluded with the application of Laponite-RD® synthetic layered silicate mixed with Synperonic™ in the staples' holes, ensuring optimal adhesion. Surface irregularities were addressed using the acrylic copolymer emulsion Acrysol™ WS-24 with fillers and pigments, followed by polishing for a smooth finish. The final result of the restoration process is showed in Figure 5.

Figure 5 – Faience basin after restoration (left) and detail of the final aspect of the piece (right).

Adhesive properties

Paraloid B72, a thermoplastic acrylic resin used in conservation, exhibits excellent chemical properties such as solubility in organic solvents like acetone, compatibility with diverse materials, and long-term stability. Its mechanical properties include moderate flexibility, good strength (Figure 6), easy application, and resistance to water and environmental pollutants, ensuring durable conservation treatments.

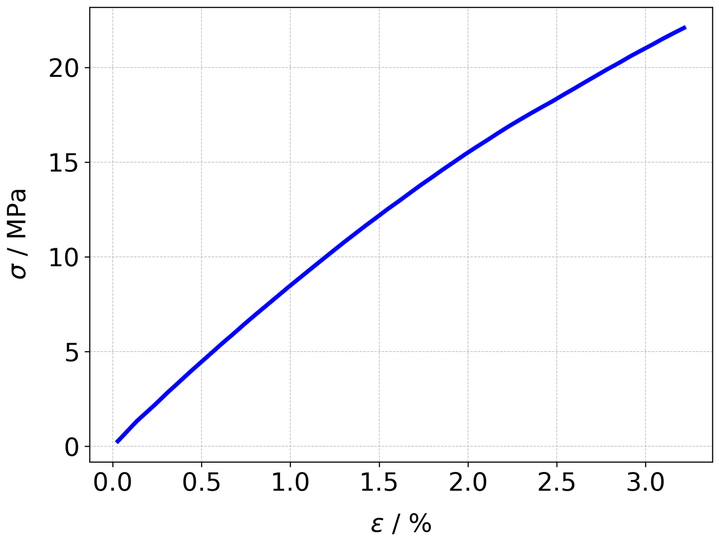

Figure 6 – Representative Stress-strain curve of the resin Paraloid B72.

Conclusions

Restoration serves as a vital conduit for the preservation of cultural heritage, safeguarding artifacts against the ravages of time and environmental degradation. In this endeavour, thermoplastic adhesives such as Paraloid B72 play a pivotal role, offering a blend of versatility, durability, and compatibility with diverse materials. By facilitating meticulous repairs and structural reinforcements, these adhesives empower conservators to uphold the authenticity and significance of historical objects, ensuring their continued appreciation and study by future generations.

3RD INTERNATIONAL CONFERENCE ON INDUSTRIAL APPLICATIONS OF ADHESIVES 2024