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Shapes of degradation – Raman spectroscopy for identification of polymers in the cast sculptures from museum collection

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Increasingly large percentages of museum, library, and archive collections are composed of objects that are in part or entirely made from synthetic polymers. Due to the inherent instability of these materials, as well as artistic experiments with additives many heritage objects made from synthetic polymers are degrading at an alarming rate. The lack of conservation expertise lead to the application of inappropriate treatments that have, in some cases, resulted in the increased degradation of objects.

Tadeusz Kantor and Alina Szapocznikow's cast sculptures were the subjects of our research. The aim of this research was to identify polymers used in these museum objects. Firstly a review of historical recipes of polymers prepared by the artists themselves was performed. The polymers and additives composing the body of the sculptures were identified and characterised with portable Raman (785 nm, Inspector Raman, DeltaNu), micro-Raman (514 nm, Jobin-Yvon T64000) and FTIR (IR Affinity-1, Shimadzu). Fillers and inorganic colorants were characterised and identified with XRF (Artax 400, Bruker), and SEM-EDS (ProX, Phenom).

In order to evaluate the state of preservation, non-invasive analysis were performed: VIS, near IR, UV photography and X-ray radiography (Dix-Ray).

The identification of the materials is the first step to make recommendations for the care and display of resin cast and plastic objects in museum collections. Through a better understanding of the materials used and the effect of artist's additives and conservation treatments, it will be possible to propose ways to limit the objects' degradation, advise on their care and display, and help to ensure their continued presence and display in the nation's collection.