The Role of Loading Agent Particle Size and Mineralogy in Formulating Compound Hafting Adhesives

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Residue analysis of stone tools from Sibudu Cave, South Africa dating to between 26-60 kya and experimental reconstructions of hafting glues have suggested that Middle Stone Age people added an ochre (iron-containing earth pigment) loading agent to the plant resin used to construct composite tools. In addition, it has been proposed that ochre particle size is a critical variable in determining the efficacy of these hafting adhesives. The study reported here addresses the effects of ochre particle size, amongst other variables, on the Work of Adhesion exhibited by adhesives based on Acacia senegal resin. Using resin, distilled water, and various loading agents, we formulated multiple adhesives and used them to construct overlap joints which were then subjected to tensile loading until failure. Quartz, clay minerals, and iron oxide ranging from clay particle to coarse sand size were evaluated as loading agents. Results indicate that iron content is unrelated to Work of Adhesion since the strongest glues contained quartz or no loading agent at all, when comparing agents in the clay-sized particle class. We suggest that the selection and transport of ochre was not driven primarily by its use as a component of hafting adhesives.