

UPGRADE OF PVAc-BASED GLUES FOR THEIR APPLICATION IN WET ENVIRONMENTS AND IN STRUCTURES. AN INDUSTRY-INVOLVING PROJECT

Santos, J.¹, Fernandes, S.², Duarte, C.¹, Caldeira Jorge, F.^{3,*}, Santos, J. A.¹ and Bordado, J.²

¹ INETI – National Institute for Engineering, Technology and Innovation,
Estrada do Paço do Lumiar, 22, 1649-038 Lisboa, Portugal

² IST – Instituto Superior Técnico, Research Centre on Biological and Chemical Engineering,
Av. Rovisco Pais, 1049-001 Lisbon, Portugal

³ GAEA – Research Group on Environment and Applied Ecology,
CIAGEB – Research Centre on Global Changes, Energy, Environment and Bioengineering,
Fernando Pessoa University, Praça 9 de Abril, 349, 4249-004 Oporto, Portugal

* Corresponding author: fjorge@ufp.pt

ABSTRACT

Polyvinyl acetate (PVAc)-based glues are very common in the furniture and joinery industries, among others, quite probably because they are relatively cheap and very easy to handle and apply. However, as the mechanism of gluing lies on the absorption of water by wood or wood derivatives, having as a consequence the coalescence of the polymer, their application is restricted to wood with less than 12% moisture content. Regarding the topic of the research work presented in short here, common PVAc glues have also fluency, meaning this that, once hardened, they are not stiff enough to be applied in glulam, for example, intended for structures, nor are they suitable for permanent or semi-permanent moist environments. This latter is because PVAc glues are reversible; i.e., moisture brings them to more or less their original liquid state.

The aim of this research work was to upgrade common PVAc glues offered in the market, hence expanding their range of applications and enlarging their market opportunities, by the application of new crosslinkers of polyurethane nature specifically synthesised for purposes of this kind. The assessment of the quality of the gluelines to wood was carried out according to the appropriated testing European standards.

The European standard *EN 204:2001 - Classification of thermoplastic wood adhesives for non-structural applications*, establishes classes from D1 less resistance to high moisture content to D4 maximum resistance to moisture content. normal PVAc glues usually classifies D2 which indicates preferential uses in occasional water contact and moisture content always

below 18 % (interior), meanwhile D3 or D4 allow more frequent contact with water and occasional higher moisture contents, as it happens in exterior covered uses. Modified PVAc glues with addition of crosslinkers allowed this type of glues to improve from D2 to D3, opening the possibility of competing with solvent emission glues.

The research team, that involved a chemical company, a wood products company, a group of researchers on polymer chemistry and a group of researchers on wood products, was successful in obtaining a glue formulation of D3 quality. The results from industrial-scale trials will also be reported. Actually, the synergy among companies and R&D organisations will also be highlighted.