Extraction of pine bark tannins in aqueous-organic systems

Lina Pepino[1], Paulo Brito[1], Fernando Caldeira Jorge[2], Rui Pereira da Costa[2], M. Helena Gil[1] & António Portugal[1]

[1] *Departamento de Engenharia Química da Faculdade de Ciências e Tecnologia da Universidade de Coimbra, Pólo II, Pinhal de Marrocos, 3030-290 Coimbra, Portugal*
[2] *Bresfor, Indústria do Formol, S.A., Estrada da Sacor, 3830 Gafanha da Nazaré, Portugal*

Tannins are naturally occurring polyphenols. Their main characteristic is their ability to bind and precipitate proteins and are also able to condense with formaldehyde or even self-condense, showing properties of adhesion. These can be used successfully in the total or partial replacement of conventional synthetic formaldehyde resins for the wood agglomerate industry. The condensed tannins are complex polymers or oligomers of flavonoid units, namely flavan-3-ols and flavan-3,4-diols and exist in significant quantities in the bark of several species of trees, namely of the Pinus genre. Pinus pinaster is the main forest specie in Portugal, and its bark is specially rich in condensed tannins. Generally, aqueous solvents are used for the tannin extraction from vegetable tissues, namely alkaline solutions which provide higher yields for the total extraction. However, it has been showed that the alkaline pine bark extracts present relatively low phenolic contents and highly polymerized tanninic fractions, specially with very alkaline extraction liquors, which negatively affect their adhesion properties. In spite of the fact that organic extractions (ethanol, methanol or acetone) allow low extraction yields (in an industrial point of view) and present some problems in their use on a non-laboratorial scale (higher costs and need for effluent treatment), they also provide much purer phenolic extracts, due to their great specificity for phenolic materials. Therefore, these solvents can be used for specific applications on this field. For this purpose, we study the extraction of tanninic compounds in aqueous/organic systems and compare the performance of the extraction and the quality of the extracts (in terms of phenolic content) with the results obtained with alkaline (sulphonated and non-sulphonated) extracts.