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Epoxidized technical Kraft lignin as a resin component for high-performance anticorrosive coatings

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Abstract

Anticorrosive coatings are applied in all scales to steel infrastructure in order to provide protection against corrosive agents. One of the major challenges nowadays in this field is the substitution of the fossil-based resins which entirely constitute these coatings, threatening the integrity of the environment when they are released over time. In this study, with the aim of obtaining a bio-based resin for anticorrosive coatings, softwood Kraft lignin was epoxidized with epichlorohydrin using KOH as base and TBAB as catalyst. A series of formulations, with varying reciprocally the quantity of commercial fossil-based epoxy novolacs and our lignin-based epoxy resin, were prepared and cured on steel panels. The structural properties of the cross-linked materials were investigated by FTIR and scanning electron microscopy (SEM). Thermal properties were analyzed by differential scanning calorimetry (DSC). Anticorrosive and adhesion properties were examined by salt spray exposure and pull-off adhesion test, respectively. The presence of lignin-based resin improved the performances and increased the bio-based content. In addition, it was confirmed the importance of the grounding and sieving procedures on the resin, which affected both films homogeneity and anticorrosive properties of the final coatings. The results achieved pave the way for a scalable process.

