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Specific crosslinking effects of poly(epichlorohydrin)-triol on urethane polymer matrix of castor seed oil-based coatings

T. O. Siyanbola, R. Enishetty, R. Kumar, O. O. James, G. I. Olasehinde, S. Kaki, R. Narayan & K. V. S. N. Raju

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#### Abstract

The contributions of castor seed oil (CSO) as a useful, nontoxic, and sustainable base material for coating systems cannot be overemphasized. This paper took advantage of the predominant fatty acid composition in CSO (i.e., ricinoleic acid). It blended a synthesized crosslinker, poly(epichlorohydrin-triol) (PECH-triol), in percentages within its polymeric matrix. Physicochemical and spectroscopic (FTIR, <sup>1</sup>H-NMR, and <sup>13</sup>C-NMR) examinations were carried out on the polyols. Thermal stability, hydrophobicity, anticorrosion, mechanical, and antibacterial properties of the prepared polyurethane (PU) coatings were examined. The 20% PECH-triol–CSO-PU film having its TON and TEND at 230.5 and 511.0°C, respectively, showed improved thermal stability when compared with the pristine film (CSO-PU). The derivative of TGA reveals a three-stage degradation step. Hydrophobicity was seen to increase from 73.3° to 92.2°, a reflection of the crosslinking effect of PECH-triol within the urethane matrix. The improved adhesion of 20% PECH-triol–CSO-PU coating on mild steel gave a better chemical resistance.

#### Graphic abstract

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