

Accepted Manuscript

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PII: S0014-3057(17)31118-7
DOI: <https://doi.org/10.1016/j.eurpolymj.2017.11.002>
Reference: EPJ 8136

To appear in: *European Polymer Journal*

Received Date: 26 June 2017
Revised Date: 30 September 2017
Accepted Date: 2 November 2017

Please cite this article as: Yadav, S.K., Schmalbach, K.M., Kinaci, E., Stanzione, J.F. III, Palmese, G.R., Recent advances in plant-based vinyl ester resins and reactive diluents, *European Polymer Journal* (2017), doi: <https://doi.org/10.1016/j.eurpolymj.2017.11.002>

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Recent advances in plant-based vinyl ester resins and reactive diluents

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Abstract

Vinyl ester resins (VERs) are used in a variety of applications. However, alternative feedstocks and molecular structures have been recently investigated due to dwindling petroleum reserves and risks associated with bisphenol A (BPA), a leading petroleum-derived precursor for VERs, as well as environmental hazards directly related to the use of petroleum-derived and classified hazardous air pollutant and volatile organic compound reactive diluents (RDs). Plant feedstocks are very common and based on their building blocks, the feedstocks can be categorized into plant oils, cellulose, and lignin. Considerable amount of work has been done on vinyl ester cross-linkers and diluents derived from plant oils, especially those prepared from soybean oil. Carbohydrate biomass-based building blocks, especially isosorbide and furan-based monomers, have a very high potential for use in commercial VERs due to the availability of raw materials and performance of building blocks. Lignin-based vinyl esters have also shown a lot of the potential to compete with their petrochemical counterparts in both cost and performance. This review covers both the topics of bio-based cross-linkers as well as RDs with emphasis on the preparation of monomers and polymers as well as the processing and properties of these materials.

Keywords: vinyl ester resin; biobased thermoset; reactive diluents; cross-linkers.

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