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Biobased polymer latexes produced by free radical emulsion polymerization of eugenol derivatives

AUTHORS

Samantha MOLINA-GUTIERREZ / ENSCM, UMR 5253, ICGM-IAM, 240 AVENUE DU PROFESSEUR EMILE JEANBRAU, MONTPELLIER
Sylvain CAILLOL / CNRS, ENSCM, UMR 5253, ICGM-IAM, 240 AVENUE DU PROFESSEUR EMILE JEANBRAU, MONTPELLIER
Vincent LADMIRAL / CNRS, ENSCM, UMR5253, ICGM-IAM, 240 AVENUE DU PROFESSEUR EMILE JEANBRAU, MONTPELLIER
Roberta BONGIOVANNI / POLITECNICO DI TORINO, DEPARTMENT OF APPLIED SCIENCE AND TECHNOLOGY, POLITECNICO DI TORINO, TORINO
Patrick LACROIX-DESMAZES / CNRS, ENSCM, UMR 5253, ICGM-IAM, 240 AVENUE DU PROFESSEUR EMILE JEANBRAU, MONTPELLIER

PURPOSE OF THE ABSTRACT

This work concerns the free radical emulsion polymerization of bio-sourced monomers derived from eugenol. Eugenol (4-allyl-2-methoxyphenol), a major component of clove oil [1], is an aromatic renewable resource with potential to replace some petroleum-based aromatic monomers. Although the reactivity of eugenol methacrylates has been studied in solution [2] and aqueous suspension polymerization [3], polymerization in aqueous (mini)emulsion has not been explored to date. The synthesis of eugenol-based monomers is a follow-up to our previous works on the polymerization of biobased aromatic monomers in aqueous dispersed media [4,5].
A facile two-step synthesis allows for high conversion and yield of the new methacrylated eugenol, isoeugenol and dihydroeugenol derivatives (Figure 1). Free radical emulsion polymerizations of the eugenol-based methacrylates were carried out using thermal and redox initiations. The resulting latexes were stable and featured an average particle diameter of 40-50 nm. These results open the door to the formulation of new bio-based aromatic latexes with potential applications in adhesives and coatings (Figure 2) [6].

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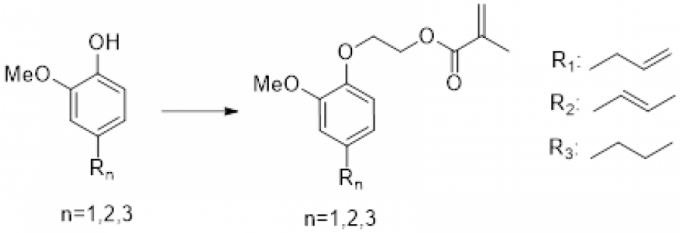
FIGURES



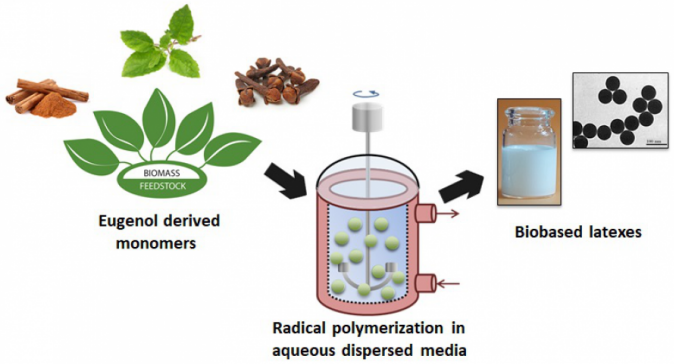


FIGURE 1

Figure 1

Structures of the eugenol-derived methacrylates (R1: eugenol; R2: iso-eugenol; R3: dihydroeugenol)

FIGURE 2

Figure 2

Biobased latexes from eugenol derived monomers

KEYWORDS

biobased latexes | emulsion polymerization | eugenol derivatives | free radical polymerization

BIBLIOGRAPHY

[1] Khalil A. A. et al., RSC Adv. 2017, 7, 32669–32681.

[2] Rojo L. et al., Biomacromolecules 2006, 7, 2751–2761.

[3] Deng J., Yang, B., Chen, C. & Liang, J., ACS Sustain. Chem. Eng. 2015, 3, 599–605.

[4] Ladmiral V., Jeannin R., Lizarazu K.F., Lai-Kee-Him J., Bron P., Lacroix-Desmazes P., Caillol S., Eur. Polym. J. 2017, 93, 785–794.

[5] Li W. S. J., Negrell C., Ladmiral V., Lai-Kee-Him J., Bron P., Lacroix-Desmazes P., Joly-Duhamel C., Caillol S., Polym. Chem. 2018, 9, 2468–2477.

[6] Molina-Gutierrez S., Ladmiral V., Bongiovanni R., Caillol S., Lacroix-Desmazes P., Green Chemistry 2018, Tutorial Review, in press. http://dx.doi.org/10.1039/C8GC02277A