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Colloidal, morphological, thermal, rheological, and film properties of waterborne hyperbranched alkyd–acrylic resins

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Abstract

Waterborne hyperbranched alkyd–acrylic resins (HAAR) are interesting materials that provide excellent properties yet require only low levels of solvent in formulations using them. However, they have been scarcely studied. Therefore, the goal of this work was to prepare and evaluate various properties of HAAR. These materials were obtained by miniemulsion polymerization from a hyperbranched alkyd resin (HAR), methyl methacrylate (MMA), butyl acrylate (BA), and acrylic acid (AA). The proportions of HAR:acrylic monomers were as follow: 50:50 (HAAR1), 40:60 (HAAR2), 30:70 (HAAR3), and 20:80 (HAAR4). The particle size increased with the content of HAR, but the colloidal stability, critical deformation, zeta potential, thermal stability, and hardness followed an opposite behavior. The order of colloidal stability of the HAAR miniemulsions was HAAR4 > HAAR3 > HAAR2 > HAAR1. The particle morphology of the HAAR was mainly core–shell, but acrylic and alkyd particles were also observed. In addition, all HAAR initially exhibited a reduction in complex viscosity (η^*) with the increase in angular frequency. The thermal

stability of the HAR was lower than that of the HAAR. The HAAR showed better resistance against a 0.10 M sodium hydroxide (NaOH) solution than HAR.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

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- Colloidal stability
- Thermal stability
- Rheological properties

- Sections
- Figures
- References

- **Fig. 1**
  extended data figure 1
- **Fig. 2**
  extended data figure 2
- **Fig. 3**

extended data figure 3

- **Fig. 4**
  extended data figure 4
- **Fig. 5**
  extended data figure 5
- **Fig. 6**
  extended data figure 6
- **Fig. 7**
  extended data figure 7
- **Fig. 8**
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