ACRYLIC-MELAMINE LATEX WITH CONTROLLED CROSSLINKING CAPABILITY

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Crosslinkable polymers are highly demanded in applications where improved thermal, mechanical, and chemical strengths are required. Among crosslinkable polymers, those with film forming capability are of high technological interest, as in coatings and adhesives. In a scenario of increasing concern for sustainability and stricter environmental legislation, coatings industry has switched to water based products, like acrylic latexes. Crosslinkable latexes aim to improve the physical properties of coalesced latex films, over the levels attainable with thermoplastic latexes, which lack hardness, toughness and solvent resistance.

This work investigated the synthesis by miniemulsion polymerization of waterborne acrylic-melamine nanocomposites with the aim of obtaining high solid-content latexes with controlled crosslinkable capability. Changes in the acrylic monomer formulation and the content of melamine resin (a commercial butylated melamine-formaldehyde resin) show a significant influence on the degree of crosslinking, and consequently, on the final properties of the acrylic-melamine nanocomposite particles, their coalesced films at room temperature (RT) and those cured at high temperature.

The hereby produced latexes exhibit low gel content and a minimum film formation temperature below 12 °C. The obtained melamine-based films are highly transparent, even after a post-treatment at 150 °C, indicating the absence of big segregated faces in the nanocomposite, which could promote opacity (Figure 1). Coalesced films formed at RT, with a low crosslinking degree, have the possibility of being cured in a later post-treatment at high temperature, where crosslinking occurs and hence solvent resistance and mechanical strength are enhanced. Figure 2 shows the mechanical performance of a waterborne melamine based film containing 15 % of melamine resin before and after curing, and its comparison with a solvent-based commercial product of equivalent composition. It can be observed that crosslinking reactions produced by post-treatment at 150 °C increase the UTS of films and reduce their elongation capability. These results show that the miniemulsion polymerization could be a promising process to obtain waterborne acrylic-melamine nanocomposites with controlled post-crosslinking capability for their potential application as coatings.

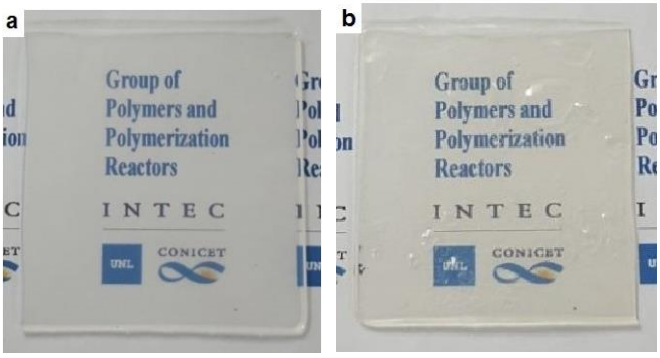

Figure 10 – Photography of melamine films before (a) and after (b) post-treatment at 150 °C.

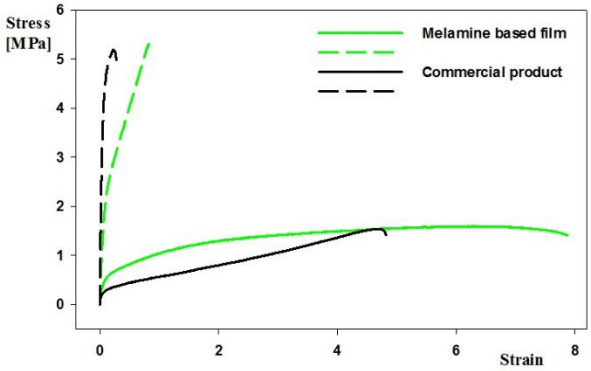

Figure 2 – Stress - strain curves for a waterborne melamine based film and a solvent-based commercial product. Coalesced film at room temperature (in continuous line) and after curing (in dash line).