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MONODISPERSE LATICES OBTAINED BY SURFACTANT-FREE EMULSION POLYMERIZATION

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Latexes of poly(vinyl acetate) and poly(butyl acrylate) were prepared by surfactant-free emulsion polymerization at 70 °C in the presence of various amounts of potassium persulfate (KPS) as initiator: 0.06, 0.1, 0.15, and 0.2 wt.%. The effect of concentration of initiator, as well as of monomer solubility on conversion, polymerization rate, colloidal stability, particle size and particle size distribution, zeta potential, and rheological behavior of prepared latexes were investigated.

It is accepted now that ionic groups formed at the decomposition of a water soluble initiator, such as persulfate, are chemically attached to the polymer chain and can offer enough colloidal stability to the latex. Therefore, the stability of surfactant-free latexes can be increased by increasing charge density and the hydrophilicity of the particle surface. The prepared latexes show an excellent storage stability.

For both vinyl acetate (VAc) and butyl acrylate (AB) the maximum rates of polymerization increases with the increase of the concentration of KPS, with higher rates for VAc, a more water soluble monomer with a well-known effect in increasing the decomposition rate of KPS. Maximum conversions show an unexpected decrease for the highest amount of KPS (0.2 wt.%). This effect could be the proof of the fact that at high concentrations, KPS is involved in termination transfer reactions, which consume the initiator and form instead a larger number of surface active oligomers that terminate before reaching the critical length for entering the particles and thereby remain in solution. The consumption of KPS in such reactions is more pronounced for VAc explaining the higher overall yield to solid polymer obtained for BA irrespective the concentration of KPS.

The particles size and size distribution are the result of two opposite effects of concentration of KPS: the increase of the initial number of oligomers and the ionic strength of latexes.