Poly(butadiene/methacrylic acid) Dispersions : pH-responsive Behaviour and the Effects of Added Ca^{2+}

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Abstract

This study investigates the effects of added Ca^{2+} on the properties of poly(Bd/MAA) dispersions (1, 3 - butadiene and methacrylic acid) and considers the effect of particle composition on the pK_a. Four latex dispersions are considered in detail. These include poly(Bd/6MAA) and poly(Bd/20MAA) which contain, 6 and 20 wt.% MAA, respectively, based on the total monomer mass used for dispersion preparation. Two model systems are also used for comparison. These are poly(Bd) and poly(EA/33MAA/BDDA) (EA and BDDA are ethyl acrylate and butanediol diacrylate) [1,2]. There was an evidence supporting that the apparent pK_a values of the poly(Bd/MAA) dispersions is strongly connected to their compositions and found to increase with Bd content. The hydrodynamic diameters and their electrophoretic mobilities exhibited major changes as the pH approached the pK_a for the particles. The critical coagulation concentrations indicated that Ca^{2+} caused pronounced dispersion instability at low pH. Interestingly, Ca^{2+} prevents swelling of the poly(Bd/MAA) particles at high pH. It was found that efficient ionic binding of all of the $RCOO^-$ groups within the poly(Bd/20MAA) particles occurred when the mole ratio of $RCOO^-$ to Ca^{2+} was less than or equal to 2.0. All the data leads to the suggestion that poly(Bd/MAA) particles have a core-shell structure of which the particle core contains mostly poly(Bd) while the shell is comprised of lightly crosslinked poly(Bd-*co*-MAA) copolymer [3,4].

References:

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