A Study of the Colloidal Properties of Carboxylated Butadiene Latex

Orawan Pinprayoon[1], Robert Groves[2], and Brian R. Saunders[1]*

[1] *School of Materials, University of Manchester, Grosvenor Street, M1 7HS, UK.*
[2] *Synthomer Ltd, Central Road, Temple Fields, Harlow, Essex, CM20 2BH, UK.*

Latexes containing copolymerized carboxyl functional monomer have many industrial uses, for example in textiles, paper and floorcoverings. As well as providing useful functionality for further reaction, ionization of the carboxyl groups, using a suitable base, imparts a significantly improved colloidal stability to the latex. In this study of the colloidal properties of carboxylated latexes, dispersions of poly(Bd/MAA), poly(Bd), and poly(Bd/AA) (Bd, butadiene; MAA, methacrylic acid; AA, acrylic acid) were used as model systems. In the present work the colloid properties are investigated to identify key factors affecting their particle morphology, pK_a and also to determine effect of cations on colloid stability (Ca, Zn, K, Na). Potentiometric titration data suggest that pK_a of MAA-containing latexes is dependent on % of MAA. The pK_a is found to be increase with decreasing MAA content in the latex particles. The pK_a values are c.a. 10.0 and 8.8 for the 6% and 20%MAA containing latexes, respectively. These high pK_a values have not been reported to our best knowledge, while the pK_a of poly(MAA) has been reported to be 5.6(1). Turbidity measurements show that $Ca(NO_3)_2$ and $Zn(NO_3)_2$ cause strong instability of these dispersions. The instability appears to involve specific binding between divalent cations and carboxylic charged moieties. There is an evidence from photon correlation spectroscopy and zeta potential measurements that small amounts of Ca^{2+} prevents swelling of the MAA containing particles. A preliminary mechanism for the interaction is presented.

References

(1) Porasso, R.D.; Benegas, J.C.; and Van den Hoop, M.A.G.T. *J. Phys. Chem. B.* **1999**, 103,2361-2365.