Reactive Polymer Latex Films

I. C. Hodges and J. Hearn

Department of Chemistry and Physics, Nottingham Trent University, Clifton Lane, Nottingham NG11 8NS

Attachment of chemical reagents and catalysts to polymeric supports offers the prospect of cleaner and more environmentally friendly chemistry [1]. Hazardous reagents are safer to handle when immobilised, having reduced vapour pressures and a reduced ability to be absorbed across skin barriers. Also expensively synthesised and precious metal compounds can more easily be recovered and re-used. Polymeric supports have commonly been macroreticular resin beads but mass transfer and intra-particle diffusion to reactive sites can limit activity [2]. The high specific surface area of colloidal sized latex particles has the joint advantages of increased contact area and a tendency for organic reagents to partition from the aqueous phase to the site of reactivity [3]. This offers a further environmental advantage of reduced use of VOC solvents. Removal of colloidal sized particles is however more difficult, requiring ultrafiltration or coagulation which may compromise re-use [4]. If functional latex particles are presented as a film then recovery and re-use becomes simple.

In this work porous polymer films have been prepared from functionalised latex particles and have been shown to retain up to 90% of the catalytic activity of the latex particles themselves. Transport pores within the films have been shown to be essential and have been generated by the inclusion of water soluble additives which have subsequently been leached. Films have been characterised by nitrogen adsorption, mercury porosimetry and conductometric titration and the characteristics related to the films' catalytic activities for ester hydrolysis.

Porous latex films used as binders have also been shown to be effective, where their non-porous counterparts failed, in dynamic adsorption studies on carbonaceous adsorbents. Porous latex particles have been included in latex films and shown to retain most of their adsorptivity.

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