

Controlling porosity within colloidal heteroaggregates

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Heteroaggregates of cationic poly(2-vinylpyridine) microgels, anionic polystyrene latex and anionic silica particles have been made by mixing dilute, aqueous suspensions. The resulting heteroaggregate flocs were then concentrated by vacuum filtration, freeze dried, and characterized by mercury porosimetry, SEM and TEM imaging techniques. Control of the pore volumes within the dried filter cakes is demonstrated by two techniques. In the first technique, heteroaggregation at a constant KCl concentration was stopped or 'arrested' by the subsequent addition of silica particles, thereby limiting the size of the flocs. Pore volume was shown to increase as the aggregation time prior to 'arrest' was increased. In the second technique, the aggregation time prior to arrest was maintained constant while the KCl concentration was varied. The pore volume of the aggregates decreased as the electrolyte concentration increased. The method of arresting the heteroaggregation potentially allows high volume fractions of flocs to be made without the formation of a gel which is difficult to process, thereby providing a method of manufacturing materials with controllable porosity. In addition, incorporation of swellable microgels in a porous structure offers potential for creating novel structures suitable for controlled release applications.