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Trivalent Metal Ion Binding to Surfactants and Polyelectrolytes : A Review

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**Dedicated to Professor Satya P. Moulik on the occasion of his 75th Birthday*

Abstract — The interactions of aqueous solutions of ionic surfactants and anionic polyelectrolytes with trivalent lanthanide ions, aluminium(III), iron(III) and chromium(III) are reviewed, with particular reference to phase behaviour and interactions between anionic head groups and the metal ions. It will be shown that various factors contribute to metal ion binding, including electrostatic interactions, cation dehydration and outer-sphere association. The importance of these systems for future directions in materials and colloid science will be highlighted.

Keywords : *Trivalent metal soaps, Metal ion flocculation, Sodium dodecylsulfate, Anionic polyelectrolytes, DNA compaction.*

INTRODUCTION

The interactions of metal ions in colloidal systems are relevant for a wide range of chemical and biological systems and processes [1]. We are particularly interested in the case of higher valent cations, which show marked differences in their effects on phase behaviour compared to their monovalent counterparts. In this review we will concentrate on interactions of trivalent metal ions with oppositely charged surfactants and polyelectrolytes. The high charge of the cations means that they are likely to bind strongly to anions. In addition, in aqueous solutions the metal ions are susceptible to hydrolysis [2], which can lead to particularly rich phase behaviour. Colloidal systems involving trivalent metal ions have applications in detergency [1], wastewater treatment [3,4], gel formation and development of thickeners and dispersants [5,6],

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