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Solid Layer Formation at Oil-Water Interfaces RIELLE DE RUITER, WILLEM TJERKSTRA, MICHEL DUITS, FRIEDER MUGELE, Univ. Twente, Physics of Complex Fluids — Metal stearates form at the interface between a decane solution of stearic acid (s.a.) and aqueous salt solutions of variable composition and pH. Studying the evolution of their mechanical, optical, and chemical properties as a function of time we find hardly any interfacial activity for pH<pKa of s.a. For pH > pKa, s.a. deprotonates at the interface and forms metal stearates, eventually leading to the formation of macroscopic solid layers. Dynamic interfacial tension measurements reveal several stages of the process, including the subsequent formation of dilute and dense monolayers followed by three-dimensional growth. In the presence of divalent ions, the solid layers display a significant increase in the dilatational storage modulus. In the presence of multiple cation species (artificial seawater) the growth of the solid layers is particularly pronounced. The layers preferentially incorporate Ca2\th as revealed by XPS and IR spectroscopy. Our results highlight in particular the importance of the synergistic effects of simultaneously present monovalent and divalent cation species on the interfacial adsorption.

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