Membrane Formation by Electrostatic Interaction of Oppositely Charged Polymer-Surfactant Mixtures

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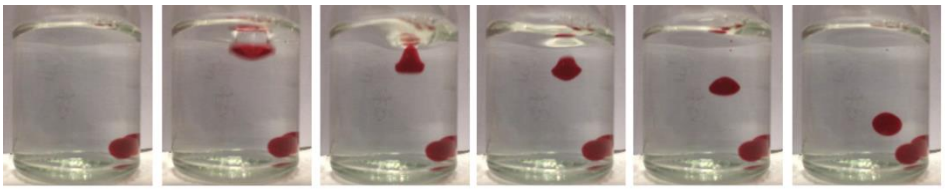
A water-in-water encapsulation method is presented here based on prompt and stable electrostatic interaction of particular pairs of oppositely charged polymer-surfactant (PS). Encapsulation is obtained simply by dripping the polymer solution into the surfactant solution (Figure 1-A). In this manner, encapsulation of several aqueous solutions were prepared (Figure 1-B). The capsule shell is a membrane, which is permeable to water and small molecules/ions and impermeable to larger molecules. Thus, it can be used as a waste-water treatment technique. In addition, a Hele-Shaw experimental setup was used for studying the membrane formation where a solution of the anionic biopolymer xanthan gum is placed in direct contact with a C_nTAB surfactant solution (n=10, 12, 14 and 16). Thereby, a polymer-surfactant membrane spontaneously forms between the two solutions due to the precipitation of polymer-surfactant complexes. The membrane grows afterwards in direction of the polymer solution. The dynamics of the growth of the membrane thickness and the mass transfer of polymer are evaluated for different surfactant types and concentrations (figure 1-C).

A



B

C

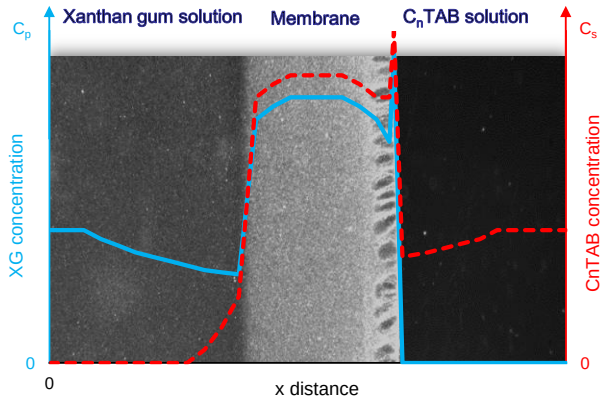


Figure 1. Left) Capsules made by 0.5 wt. % xanthan gum by dripping in 8 g/L $C_{12}TAB$ solution. Right) Qualitative description of XG and C_nTAB concentration profiles through the membrane.