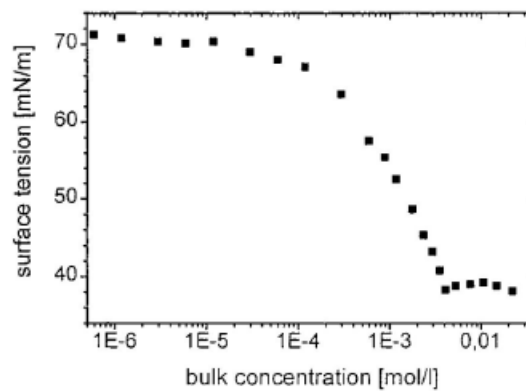


Self-assessment test with focus on COSOM subjects (2)

1. How is the interfacial tension γ thermodynamically defined?
2. Amphiphiles greatly reduce the interfacial tension of water which normally has a value of 72 mN/m. A characteristic equilibrium stress isotherm is shown in the following figure. Are the spherical micelles produced by the CMC monodisperse with one well-defined radius or do they form aggregates with a wide distribution in size? Rationalize your answer.



3. Two substances A and B are completely immiscible in their solid state, but can be mixed at will when liquefied. Sketch the phase diagram of this system in a temperature / molar fraction (T/x) diagram. Identify the phases present.
4. Give a definition for Raoult's law.
5. The Sabatier process allows us to convert CO₂ into methane with the help of hydrogen gas at high temperatures: $\text{CO}_2 + 4 \text{H}_2 \rightarrow \text{CH}_4 + 2 \text{H}_2\text{O}$
 - a) Calculate the standard reaction enthalpy $\Delta_r H$ from the standard formation enthalpies $\Delta_f H$. ($\Delta_f H(\text{CO}_2) = -392 \text{ kJ/mol}$; $\Delta_f H(\text{H}_2\text{O}; \text{gas}) = -242 \text{ kJ/mol}$; $\Delta_f H(\text{CH}_4) = -75 \text{ kJ/mol}$)
 - b) Is this reaction exothermic or endothermic? What is the effect of a temperature increase on the equilibrium position?