ipt Instituto Politécnico de Tomar

**MASTER in CHEMICAL TECHNOLOGY**

SURFACE AND INTERFACE CHEMISTRY

**Exercises – Surface Tension (2)**

**1.** The contact angle for water in clean glass is close to zero. Calculate the surface tension of water at 30° C, since, at that temperature, the water rises to a height of 9.11 cm in a clean glass capillary tube of 0.32 mm radius. The density of water at 30° C is equal to 0.9956 $g.cm^{-3}$.

**2.** If air bubbles with $10^{-7}$ m in diameter, exists in water, just below the boiling point, how will the water be superheated at normal atmospheric pressure before boiling begins? The surface tension of water at 100° C is 59 $mN.m^{-1}$ and the enthalpy of vaporization is 2.25 kJ $g^{-1}$.

**3.** At 20° C the surface tension of water and n-octane are 72.8 and 21.8 $mN.m^{-1}$. Calculate: a) the work of adhesion between n-octane and water: b) the energy of cohesion for n-octane and water; c) the initial spreading coefficient of n-octane in water.

**4.** The contact angle of water in wax (paraffin) is 105° at 20° C. Calculate the work of adhesion and the spreading coefficient. Consider $\gamma$= 72.75 $mN.m^{-1}$.

**5.** At 20° C the capillary rise of methanol in contact with air in a tube of 0.35 mm diameter is 3.3 cm. Considering null the contact angle, calculate the surface tension of methanol knowing that the densities of the liquid and air are respectively 0.7914 and 0.0012 $g.cm^{-3}$. Knowing that the critical temperature of methanol is 512.6 K estimate the capillary rise at 30° C (make the approaches considered reasonable).

**6.** The surface tension of mercury is 470 dine.cm$^{-1}$ at 273 k. Calculate the capillary depression in a 1 mm diameter tube if the contact angle is 140°. The density of mercury is 13.6 g.cm$^{-3}$.

**7.** It was observed the variation of the surface tension of aqueous solutions of CTAB surfactant C16 with concentration at 25° C. Calculate the area occupied by a molecule of CTAB on the interface liquid-vapor, when micelles begin to form in solution.