

### Problem 15-02 Spreading coefficient, cohesion work

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A drop of liquid placed on the plane surface of paraffin exhibits the contact angle  $128^\circ$ . The surface tension of the liquid is  $28.5 \text{ mN m}^{-1}$ . Calculate the cohesion work and Harkins spreading coefficient.

$$[W_c = 43 \text{ mJ m}^{-2}, S_{\ell/s} = 47.5 \text{ mJ m}^{-2}]$$

Solution:

$$\gamma_{\ell g} = 29.4 \text{ mN m}^{-1} = 29.4 \text{ mJ m}^{-2}$$

$$\theta = 128^\circ$$

$$W_c = 2 \gamma_{\ell g} = 2 \cdot 21.5 = 43 \text{ mJ m}^{-2}$$

$$S_{\ell/s} = \gamma_{sg} - \gamma_{\ell g} - \gamma_{\ell s}$$

Young equation:

$$\gamma_{sg} - \gamma_{\ell s} = \gamma_{\ell g} \cos \theta$$

$$S_{\ell/s} = \overbrace{\gamma_{sg} - \gamma_{\ell s}} - \gamma_{\ell g} = \gamma_{\ell g} \cos \theta - \gamma_{\ell g} = 29.4 \cdot (\cos 128 - 1) = -47.5 \text{ mJ m}^{-2}$$