RESEARCH OF SURFACE AND ADHESION ENERGIES OF VAN DER WAALS FORCES BETWEEN SURFACES

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Surface energy or interface energy qualifies the disruption of intermolecular bonds that occurs when a surface is created. In the physics of solids, surface must be intrinsically less energetically favorable than the bulk of a material; otherwise there will be a driving force for surface to be created. Adhesion energy also represents the sum of all energies produced by interactions between the substrate and adhesive itself. Van der Waals forces play a central role in all phenomena involving intermolecular forces.

The aim of this work was to study how surface energies are determined from the intermolecular forces between two surfaces.

The total energy per unit area of two planar surfaces at a distance D apart is given by

$$W = \frac{A}{12\pi D_0^2}\left(1 - \frac{D_0^2}{D^2}\right)$$

where A – is the Hamaker constant, D_0 – interfacial contact separation. By increasing the surface area of medium by one unit area its free energy changes by some value γ that called surface energy or surface tension.

At $D = Do$ (two surfaces in contact), $W = 0$, while for $D = \infty$ (two isolated surfaces),

$$W = \frac{A}{12\pi D_0^2} = 2\gamma,$$

where γ - is the surface energies of solids and liquids (for a liquid, γ is usually referred to as its surface tension).

or

$$\gamma = \frac{A}{24\pi D_0^2}$$

In other words, the surface energy γ equals half the energy needed to separate two flat surfaces from contact to infinity, it is half the adhesion energy.

Thus, for calculating surface energies there propose to use an interfacial contact distance D_o that is substantially less than the interatomic or intermolecular centre-to-centre distance.