Experimental investigation of the link between static and dynamic wetting by forced wetting of nylon filament

Forced wetting experiments with various liquids were conducted to study the dynamic wetting properties of nylon filament. The molecular-kinetic theory of wetting MKT) was used to interpret the dynamic contact angle data and evaluate the contact-line friction zeta(0) at the microscopic scale. By taking account of the viscosity of the liquid, zeta(0) could be related exponentially to the reversible work of adhesion. This clearly establishes an experimental link between the static and dynamic wetting properties of the material. Moreover, statistical analysis of the equilibrium molecular displacement frequency K-0 and the length of the displacements lambda reveals that these two fundamental parameters of the MKT are strongly correlated, not only in the linearized form of the theory (valid close to equilibrium) but also when the nonlinear form of the equations has to be considered at higher wetting speeds.