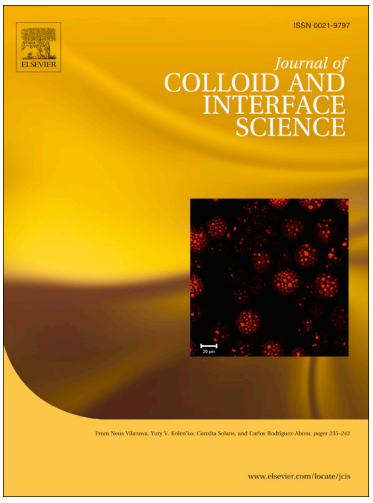

Propulsion of liquid marbles: a tool to measure their effective surface tension and viscosity

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Propulsion of liquid marbles : a tool to measure their effective surface tension and viscosity.

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Abstract :

The effective surface tension of lycopodium-coated liquid marbles is calculated from the analysis of their free vibrations. Levitation of liquid marbles was achieved by the catapult mechanism. The effective surface tension was calculated with the Rayleigh formula for eigen-frequencies of oscillating spherical droplets. The calculated effective surface tension is close to the values, obtained by other experimental methods and supports the suggestion that the effective surface tension of lycopodium-coated marbles is markedly lower than that of the bare water/vapor interface. The analysis of damping of oscillations of levitating marbles enabled introduction of the notion of « effective viscosity » of marbles. A semi-quantitative model elucidating the energy dissipation in oscillating marbles is proposed. The scaling law describing the viscous dissipation in liquid marbles is derived and shown to be in good agreement with experimental results.