

## Macroscopic Observations of Adhesion Behaviors between Clathrate Hydrates and Water

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Here, we introduced the noble method for measuring contact force between clathrate hydrate and solution droplet by using the z-directional microbalance. Repetition of precise measurements over several cycles from contact to detachment is obtained in a CP/n-decane oil mixture. First, we identified the effects of volumetric ratio of CP and n-decane in a bath and the substrate morphology on the contact force. Second, we reported the effect of chemical additives on the contact force, interfacial tension and adhesion energy between cyclopentane (CP) hydrate and solution droplet. Finally, we tried to identify the volume-dependent adhesion behaviors between cyclopentane (CP) hydrate and water droplet in a CP/n-decane oil mixture.