Interactions between apolar, basic and acidic model oils and a calcite surface

In this study, the atomic force microscopy colloidal probe technique was employed to investigate the interaction between apolar, basic and acidic model oil probes and a calcite surface in solutions containing different concentrations of NaCl, CaCl₂ and Na₂SO₄. In the presence of SO₄²⁻, hydration and structural forces were observed between apolar model oil probes and a calcite surface on approach. Relatively low adhesion forces were observed between the basic model oil probes and the calcite surface, while higher adhesion forces were observed between the acidic model oil probes and the calcite surface. Furthermore, the adhesion forces between the basic model oil probes and the calcite surface significantly increased in the presence of SO₄²⁻, while the adhesion force between the acidic model oil probes and the calcite surface decreased in the presence of Ca²⁺ or SO₄²⁻. The differences in the adhesion forces are related to electrostatic attraction and ion bridging forces between the model oil probes and the calcite surface.

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