

## Specific ion effects on the interaction of hydrophobic and hydrophilic surfaces

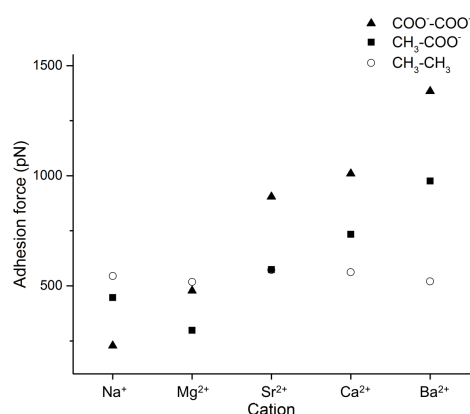
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Most natural surfaces are covered with organic material. Although interactions between organic compounds and mineral surfaces in aqueous environments have been widely studied, the mechanisms that take place in nanoconfinement have not yet been fully understood. It is unclear how surface forces at the nanoscale influence macroscale systems.

We investigated the influence of several ions on the interaction between model, self assembled monolayer (SAM) surfaces, which were tailored to have an alkane (hydrophobic) or carboxylate (hydrophilic) end. Atomic force microscopy (AFM) in chemical force mapping (CFM) mode was used to measure adhesion forces between the functionalized surfaces, to gather fundamental information about the role of ions in the functionality of organic compounds.

In CFM, the adhesion force between hydrophobic surfaces, was unaffected in 0.5 M NaCl solutions that contained 0.012 M divalent cations. In a system with carboxylate replacing either one or both hydrophobic surfaces, a reproducible change in adhesion with specific ions was observed. The trend of increasing adhesion force follows the pattern  $\text{Na}^+$ ,  $\text{Mg}^{2+} < \text{Sr}^{2+} < \text{Ca}^{2+} < \text{Ba}^{2+}$  (Figure), suggesting that the size of the ion as well as the hydration shell has an important role in the interaction. The results obtained give fundamental insights into the possible mechanisms of interaction between organic groups in different cationic environments.



Average adhesion force measured for the hydrophobic (CH<sub>3</sub>-CH<sub>3</sub>), partially hydrophilic (CH<sub>3</sub>-COO) and hydrophilic (COO-COO) systems under different cationic solutions.