Impact of molecular structure on the electrotunable lubrication of ionic liquids

Friction is responsible for significant energy losses on the industrial scale and material fatigue, degradation and mechanical failure. Room Temperature Ionic liquids (RTILs) are promising lubricants due to their unique thermophysical properties: chemical and thermal stability, low vapour pressure and low melting temperature. Further, external electrostatic fields provide a route to modify their structure and tune the lubrication properties. We will discuss recent simulation studies to establish microscopic correlations between the molecular structure of imidazolium RTILs, nanoconfinement, and confining plates' surface charges. Evidence is shown for lateral structuring of the ions, leading to a significant reduction of friction. Furthermore, the lateral order can be activated or inhibited by changing the polarity of the confining surfaces, hence providing a mechanism to control friction with electric fields.