Currently, the pharmaceutical industry relies on active pharmaceutical ingredients (APIs) in solid form which can be achieved with controlled crystal size and product solubility. However, these solid APIs frequently have problems related with polymorphic conversion, low solubility and thus, bioavailability. The unique properties of room-temperature molten salts, also called ionic liquids (RTILs), led to the development of a new strategy to combine ILs with APIs in order to obtain IL-APIs that are liquid at the human body temperature.

In the present work three ionic liquids with possible application in the field of pharmaceuticals were studied: lidocaine docusate (LD), didecylmethylammonium ibuprofen (DI) and ranitidine docusate (RD). These ILs were first synthesized by Hough et al [1] who used calorimetry to determine the following “liquid-liquid” transition temperatures, $T_{\text{Trans}}$: 351K for LD, 342 K for DI and 302 K for RD. The surface tension was measured by drop shape analysis using an environmental chamber (Ramé-Hart) modified to allow for measurements in an extended range of temperatures and the density was determined with an Anton Paar density meter. The temperature dependence of the density was described by second-order polynomials. The surface tension was measured as a function of time until stabilization.

For RD, measurements were possible only for temperatures above $T_{\text{Trans}}$ due to its extremely high viscosity, the surface tension decreased linearly with temperature. The surface tension of LD and RD has a discontinuity in the neighborhood of the respective transition temperatures. In this region the surface tension increases with temperature, which is consistent with the presence of an ordered interface, eventually a nematic phase, as suggested by the theoretical study of the anomalous surface tensions of liquid crystals by Martínez-Ratón et al [2].