Ion adsorption-induced wetting transition in oil-water-mineral systems BIJOYENDRA BERA, ANDREA CAVALLI, DIRK VAN DEN ENDE, FRIEDER MUGELE, Univ of Twente — The relative wettability of a rock substrate to oil and water is a central issue in many technological applications, especially in the field of enhanced oil recovery. We here consider a salty water droplet deposited on a mica substrate inside an oil bath. By adding specific ions to the water phase, a wetting transition can be induced. The water solution completely wet the mica substrate if it only contains monovalent cations (K\(^+\),Na\(^+\)). However, when divalent (Ca\(^{2+}\), Mg\(^{2+}\)) cations are added to the water phase, a finite contact angle (around 10\(^\circ\)) can be observed. We explain this phenomenon in the scope of a Poisson-Boltzmann model. The absorption of divalent ions at the mica interface generates a positive surface charge, and induces an attractive interaction to the negatively charged oil-water interface, which triggers the transition. We also observe that different cations can be arranged in a Hofmeister-like sequence, based on their effectiveness in changing the wettability of the mineral substrate. Finally, we show that adding small amounts of a polar surfactant to the oil phase synergistically enhances the wetting transition.