



0.1 Surface Energy Characterization of Heterogeneous Soil Particles

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During the past decades, wettability problems of soil have received increasing attention. Wettability of soil affects hydrological processes like infiltration, percolation, preferential flow, and surface runoff. The problem of determining contact angles and surface energy of powders, e.g. soil particles, is still an open question. Our objective was to test the capability of the easy-to-apply Wilhelmy Plate Method (WPM) for deriving surface properties of irregular shaped and chemically heterogeneous soil particles.

We determined advancing and receding contact angles by using model soils varying in a wide range of texture and hydrophobicity. Additionally to water, we used water-alcohol mixtures to vary surface tension of the liquid. Contact angle data were used to determine the free surface energy of the model soils by two different approaches: Applying the first approach, we determined the critical surface tension of the liquid, where the contact angle approaches zero (concept of critical surface tension, Zisman, 1964). These values were compared with surface energies determined using the approach of Chibowski (2002), while making use of the contact angle hysteresis. The second approach is founded on the use of contact angle data which were also compared with those obtained with the independent and well established Capillary Rise Method (CRM), based on the Lucas-Washburn equation.