

Surface Group Analysis of the Non-Conductive Nanoparticles using Impedance-SPM

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In this study, an impedance-SPM based method of surface analysis was developed for the surface characterization of the non-conductive nanoparticles. Comparing to the conventional surface analysis method, this impedance-SPM method is relatively simple which does not require additional sample processing. Only small amount of sample is required and the measurement can be performed at room temperature and atmospheric pressure. When AC current was applied to the discrete single nanoparticle through SPM, impedance spectrum was obtained. This impedance spectrum is dependent to the surface functional groups. Thereby, the surface functional groups can be characterized through the analysis of the impedance spectra. For the analysis, an electric circuit model was determined, and elements of the circuit model was determined through non-linear data fitting. The electrical element is characteristic to the surface functionality. In conclusion, the nanoparticles with different surface groups showed different impedance signal, which was applied as a toolkit for the surface analysis. This technique is expected to provide new analysis method that can contribute to the nanoparticle technology.