A method to measure the surface state distribution of Insulators by KPFM

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***Abstract* — Surface state distribution of the insulators is an important factor which affects the magnitude and polarity of charge transfer when a metal rubs with an insulator. However, accurate measurement of surface state distribution of the insulators during triboelectrification still remains difficulty. In this study, a method was developed to measure the surface state distribution of insulators in the forbidden band by changing the effective Fermi level of the counterpart conductive tip. Electrification of a PTFE film and a Cr-Pt coated conductive tip (tip apex radius 25nm) was studied by using a KPFM (Kelvin Probe Force Microscope). By applying bias to the tip, various effective Fermi level of the Cr-Pt coated tip was obtained. The number of surface states of the PTFE film in the gap of two energy level was achieved by comparing the magnitude of charge transfer between the PTFE film and the Cr-Pt coated tip with different effective Fermi level. The relationship between the magnitude of charge transfer and the effective Fermi level of tip was observed and the density of surface states was obtained by differentiating the magnitudes of transferred electron on the effective Fermi level. By using this method, the surface state distribution of PTFE was measured, result shows that the density of surface state of PTFE near the highest filled surface energy level is lower than that far from the highest filled surface energy level. This method might be utilized to study the effect of surface state distribution of insulators on triboelectrification.**