Seeing is Believing: Scanning Probe Microscopy of Electrification

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***Abstract*— As shown by the centuries of research investigating its mechanism, electrification of dielectrics is a complex phenomenon. Here we demonstrate the power of the modern instrumentation and chemical methods in solving the mysterious problem of electrification at nano/molecular level. We have recently shown that upon charging of dielectric surfaces, (charged and uncharged) reactive species form. These species are imaged at their nanodomains, to display their coexistence and colocalization, by using combinations of edge modalities of Atomic Force Microscopy (AFM) such as Kelvin Force Microscopy (KFM), PeakForce Quantitative Nanomechanical Property Mapping (PF-QNM), and Magnetic Force Microscopy (MFM). The interactions of the reactive species are analyzed by combining these imaging modalities and chemical techniques. By this way, pure polymers, conventional polymer products, polymer blends and nanocomposites can all be analyzed for their charging/discharging behavior. This information not only provides "an image of the mechanism of electrification" that was not previously available at this level, but also helps to develop systematic (chemical) methods to prevent hazardous effects of electrification on dielectrics.**