



Physical Sciences Seminar

Scratching the Surface of Triboelectrification with Triboluminescence

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Host: Scott Waitukaitis

Since the ancient Greeks rubbed fur on amber to attract objects ~2,500 years ago, many prominent scientists have studied triboelectrification: the observed exchange of charge when materials are brought into contact. With such a long history of study, one might assume triboelectrification is a solved problem of science. However, it still remains as little more than an observed effect, with no fundamental theory of how much charge, or even what charge species, will be exchanged between 2 materials in contact. When scotch tape is peeled in a vacuum, 40 keV X-rays are readily generated from sub-mm regions in $< \text{ns}$ bursts from the resultant static charge. How can diffuse, macroscopic mechanical action concentrate to highly energetic photons emitted from microscopic regions? What theory allows for the transfer of $> 10^{12}$ unit charges per cm^2 through mechanical action alone? More simply, what causes charge to move between insulating materials at all? Triboelectric X-rays (TEX-rays) are more than a party trick: they provide us with a diagnostic tool that shows the true scale of triboelectrification, opening up measurements at previously unreachable scales. We present experimental data on triboelectrification of single crystal materials, and propose theory that incorporates modern understanding of surface- and interface-physics into the few understood aspects of triboelectrification: specifically, that the latent polarization of a reconstructed surface provides the electrical instability required to begin the triboelectric charging process, with charge mobility provided via the diffuse double-layer of an adsorbed liquid.

Friday, September 20, 2019 03:30pm - 05:00pm

Heinzel Seminar Room / Office Bldg West (I21.EG.101)



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