Probing Surfaces and 2-D Materials with Beams of Low Energy Positrons

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Wednesday March 8, 2017
4:00 Room 103 Science Hall

Abstract

The annihilation of positrons with core electrons results in unique signatures in the spectra of Auger-electron and annihilation-gamma rays that can be used to make clear chemical identification of atoms in the environment of the positron at the time of annihilation. Positrons implanted at low energies trap with high efficiency at an image-correlation just outside the top layer of atoms at the surface. This makes it is possible to use annihilation induced Auger and Gamma signals to probe the surfaces of solids with single atomic layer depth resolution. In this talk I will report recent research conducted in collaboration with Prof. Ali Koymen, employing Positron Annihilation Induced Auger Electron Spectroscopy (PAES) and Auger-Gamma Coincidence Spectroscopy (AGCS) to the study of surface structure and surface chemistry. Our research has demonstrated that PAES can be used to obtain Auger spectra with the extremely low background, and increased surface sensitivity and can thus provide new information regarding the composition of the top-most atomic layer. The applicability of PAES to catalytically important surfaces of oxides and the surfaces of 2-D systems including the Topological Insulator, Bi2Te2Se, and Graphene will be discussed in the light of recent measurements. We will conclude with a discussion of the use of Auger-Gamma and Gamma-Gamma coincidence spectroscopy for in-situ studies of surfaces.

Refreshments will be served at 3:30 p.m. in the Physics Library