PHOTO-, DUAL- AND EXOELECTRON SPECTROSCOPY TO CHARACTERIZE NANOCOATINGS AND NANOSTRUCTURES

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Nanocoatings and nanostructures are requesting non destructive methods to get information scaled to several nanometers for material characterization. Such the demands could be satisfied owing to measurements of emission of electrons when they have a nanometric mean free path corresponding to energy ≤ 1 eV. This mode is in use for prethreshold photoelectron, dual and prethreshold exoelectron emission based spectroscopy.

Ultraviolet radiation (UVR) is suitable to excite such the emission. When temperature (T) of the tested object is a constant, UVR promotes classical photoelectron emission (PE), typically energy of the photons ($h\nu$) being selected close to an electron work function (φ), $h\nu > \varphi$. The value of φ, as well origin of electron transitions could be recognized because of the electron emission current (I) regularity in dependence on $h\nu$. In a case, when T = var, modulation of density of electron states (N) and/or surface potential could be provided, the emission current being affected. By this way the photothermostimulated exoelectron emission (PTSE) mode is achievable. Typically N is affected owing to relaxation of point type imperfections. In such the case a concentration of relaxing imperfections, their annealing and migration activation energies are available from I = I(T) regularity processing. If the tested object is characterized with an energy gap, electrons and holes could be employing addition (to UVRt) radiation having and energy of the photons a little bit more that the energy gap. This is the dual emission mode (DE). As the result the current of PE or PTSE is modulated. By

this way the energy gap, excitation and decay time of a surface potential are available for estimation.

The technique and examples to characterize naonocoatings and nanostructures are provided.