

ELECTRON EMISSION SPECTROSCOPY OF POROUS SILICON SURFACES

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The real porous Si surface's elemental and phase compositions are studied by Auger electron spectroscopy (AES) and thermostimulated exoemission (TSEE) with mass spectrometry (MS) analysis in situ. AES studies give evidence that the real surface of por-Si contains phases of almost atomically clean Si or Si bound with hydrogen, Si oxides and carbon amorphous mixtures - $\text{Si}_y\text{O}_x\text{C}_{1-x-y}$ coatings on the Si substrate. The composition of por-Si surfaces and TSEE are studied in dependence on the degree of porosity, exposition time of the samples in laboratory atmosphere after creation of a porous structure, aging in vacuum, and dose of electron irradiation. TSEE and MS studies of por-Si samples exposed to laboratory atmosphere after electrochemical etching show the essential desorption processes of adsorbates slightly bound with the por-Si surface and also exoelectron emission during certain physical-chemical processes in adsorbates' thin film coatings. TSEE spectra of electron-beam irradiated samples reveal the presence of at least two types of exoemission centers that are associated with silicon atoms in intermediate oxidation states. The kinetic and energetic parameters of the processes resulting in TSEE and also concentration of electron traps are evaluated. The presence of adsorbates and significant dielectric coatings on the developed surface of por-Si might have a significant role in luminescent properties of por-Si.