

Positronium in mesopores of silica thins films

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Correctly evaluation of meopores by positron annihilation needs deep understanding of behaviours of positronium (Ps) atoms in mesopores. In this talk, positronium behaviors in pores of various mesoporous silica thin films, deposited on Si wafers via a sol-gel method using either triblock copolymers or a cationic surfactant as structure-directing agents, were studied by positron annihilation spectroscopes based on slow positron beams. Pore surface chemistry, interconnectivity and morphology on Ps diffusion, annihilation characteristics in mesopores are reviewed[1-7]. Ps lifetime in mesopores is associated with pore size, pore geometry and pore surface chemistry. Ps emission/3g annihilation depends not only on the pore interconnectivity but also on pore morphologies due to Ps localization in larger pores. Because of the nature of Ps confinement in nano-channels, orientation of tubal pores could be distinguished by measuring S, W parameters of positron annihilation in ordered pores aligning along silica film surface using Doppler Broadening of annihilation radiation (DBAR). This makes it possible to evaluate morphologies of mesopores both in silica films and around the interface between the silica film and Si substrate.

This work was supported in part by National Natural Science Foundation of China (NSFC) under Grants 11375132&11575130.

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