Effect of Thermal Rearrangement of Organosilica/Block Copolymer Hybrids on the Mesostructures of Thin films

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Highly ordered inorganic mesoporous thin films have been regarded as quite attractive in potential applications such as separation, catalysis, sensors, and electronic devices. Recently, we and other groups have reported periodic mesoporous organosilicas (PMOs) unique in containing organic functional groups inside the channel wall. The organic modification of the silica framework have several advantages of diverse variation of mechanical, optical and electrical properties. In our previous work, we prepared mesoporous ethanesilica thin films using PEO-PLGA-PEO block copolymers as structure directing agents and BTESE (1,2-bis(triethoxysilyl) ethane (BTESE); bridged organosilicate) as inorganic precursors by spin-coating process. Here, mesoporous ethane-bridged silica film was prepared in a one-pot synthesis of sol-gel condensation. It is revealed that mesoscopic order develops through silica condensation and rearrangement of block template/organosilica composite during calcinations. We show the extent of ordering can be increased by optimizing aging time and the film thickness.