Easy access to highly crystalline mesoporous transition-metal oxides with controllable uniform large pores by using block copolymers synthesized via atom transfer radical polymerization

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Highly crystalline and thermally stable mesoporous titanium oxide and niobium oxide with uniform pores are synthesized by empolying laboratory made poly (styrene-b-ethylene oxide), (PS-*b*-PEO), diblock copolymers as structure directing agent. The PS-b-PEOs with various molecular weights are prepared through simple synthetic method called atom transfer radical polymerization (ATRP). With the increase of molecular weight of PS-*b*-PEO, the pore size of TiO_2 is tuned in the range of 14.9–20.7 nm (The resulting materials are denoted as PS_x-TiO_2). The highly crystalline PS-TiO_2s exhibit promising photocatalytic activity in both hydrogen evolution and methylene blue (MB) degradation compared to conventional TiO_2 templated by Pluronic P123 (P123-TiO_2). Though PS_x-TiO_2 has smaller surface area than the P123-TiO_2, it exhibits high activity due to efficient charge transfer resulting from high crystallinity of mesostructured walls. Notably, the approach used in this research can be easily adopted by researchers without any prior experience in polymer synthesis.