

Novel Fabrication of Designed Silica Structures Inspired by Silicatein- α

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Silicatein- α , the enzyme extracted from silica spicules in glass sponges, has been studied extensively in the way of chemistry from 1999, in which the pioneering work by Morse, D. E. - the discovery of the enzymatic hydrolysis in Silicatein- α - was published. Since its reaction conditions are physiologically favored, synthesis of various materials, such as gallium oxide, zirconium oxide, and silicon oxide, was achieved without any hazardous wastes. Although some groups synthesized oxide films and particles, they have not achieved yet controlled morphogenesis in the reaction conditions mentioned above. With the knowledge of catalytic triad involved in hydrolysis of silicone alkoxide and oligomerization of silicic acid, we designed the novel peptide amphiphiles to not only form self-assembled structure, but also display similar activities to silicatein- α . Designed templates were able to self-assemble into left-handed helices for the peptide amphiphiles with L-form amino acid, catalyzing polycondensation of silicic acids onto the surface of them. It led to the formation of silica helices with 30-50 nm diameters. These results were characterized by various techniques, including SEM, TEM, and STEM. Given the situation that nano-bio-technology, the bio-applicable technology in nanometer scale, has been attracting considerable attention; this result could be applied to the latest applications in biotechnology, such as biosensors, lab-on-a-chip, biocompatible nanodevices.

Keywords: Silicatein- α , Glass sponges, Silica, Peptide amphiphiles, Nanotechnology