

Biosilicification and Biosilica: Design and Application of Silica-Forming Proteins

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The applications of silica nanoparticles (silica NPs) in biotechnology and nanobiotechnology fields have quickly increased. In general, silica NPs are synthesized by three methods, namely, the sol-gel process, reverse microemulsion, and flame synthesis. Recently, bio-inspired silica formation catalyzed by biomolecules under mild reaction or physiological conditions has been achieved owing to the possibility to avoid high temperatures and hazardous reactants. To date, various reports have been done on the use of silica-forming proteins (silaffins, silicateins, silacidins, cathepsin-like protein) and peptides (R5, EctP1, EctP2, and the peptides isolated from the phage display peptide library) as well as on analyses of how silica-forming proteins (SFPs) could mediate silica formation. In this study, we designed SFP-fusion proteins as nanobiomaterials useful for biotechnological and biomedical applications.