

Biological production of inorganic nanomaterials using microbial cells and bacteriophages and their applications

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Here, we survey biosynthetic inorganic NMs of 55 elements and their applications in catalysis, energy harvesting and storage, electronics, antimicrobials and biomedical therapy. We describe the emerging area of inorganic NM biosynthesis, emphasizing the mechanisms of inorganic-ion reduction and detoxification, while also highlighting the proteins and peptides involved. We show how analysing a Pourbaix diagram can help us devise strategies for the predictive biosynthesis of NMs with high producibility and crystallinity and also describe how to control the size and morphology of the product. [This work was supported by the Technology Development Program to Solve Climate Changes on Systems Metabolic Engineering for Biorefineries from the Ministry of Science and ICT through the National Research Foundation (NRF) of Korea (NRF-2012M1A2A2026556 and NRF-2012M1A2A2026557).] (Reference: Choi, Y., Lee, S.Y. (2020) Biosynthesis of inorganic nanomaterials using microbial cells and bacteriophages. Nat. Rev. Chem. 4, 638–656.)