

Carbonatogenesis: Microbial Activity in Monuments and Artworks Conservation

Author(s) Swaranjit Singh Cameotra

Institution(s) 1. CSIR, IMTECH, 39A Chandigarh

Abstract:

Since ancient time, magnificence and beauty have been the goals of architecture. Artists and architects used high strength, durable and beautiful sedimentary rocks like marble and limestone for the construction of sculptural monuments like Taj Mahal (India), Milan Cathedral (Italy), Roman Catacombs, and Necropolis in Rome (Italy) etc. These historic monuments are exposed to open air which allows the invading army of algae, cyanobacteria, fungi, and lichen etc. to easily access them and inhabits them. The invasion of microorganism and their subsequent interaction with mineral matrix of the stone substrate under varied environment conditions fosters the deterioration of stone substrate of monuments and artworks by multiple mechanisms resulting in the loss of physical strength, durability, value and aesthetic appearance. Over the last few decades there has been increasing global concern over the deterioration of historical monuments and stone works of art. It has posed a big challenge for the archaeologist, geobiologists and bioconservators and consequently encouraged the search for developing novel preventive and remedial methodologies for safeguarding these sculptural monuments and stone works of art. Many conventional methods which rely on use of physical and chemical treatments were applied but none of them yielded satisfactory results. Recently, bioconservation and consolidation methods employing carbonatogenic microbes have received much attention. These microorganisms can precipitate the calcium carbonate and consequently confer protection to historic monuments making the process important in bioconservation regimes. Culture Collections can play a very important role in development of this new area. Protecting and restoring the historic monuments and stone works seems to be a difficult task. Though research in this field has seen many advances in terms of development of effective delivery systems, efficient algicides, biocides and photocatalytic based technologies however, inefficient in-depth consolidation, resistance of some microbes to biocides treatments has raised another issue. Therefore, the fruitfulness of the conservation treatment can be envisaged only if all necessary measures for preventing future growth of microorganisms (resurrection) are properly followed. The treatment aiming conservation and restoration may turn frivolous or useless if the monuments and stone works are not cared afterward

Key words: Carbonatogenesis, Microbial Activity, Monuments, Artworks, Conservation