ISOLATION AND RECRYSTALLIZATION OF BACTERIAL SURFACE LAYER PROTEIN FROM URANIUM RESISTANT BACTERIA AND ITS REASSEMBLY INTO NANOSTRUCTURES

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Abstract

This present research work aims at investigating the microbial S-layer protein based self assembled nanostructures from native bacterial species isolated from radioactive ore samples. The bacterial surface layer protein (Slp) is a para-crystalline, self-assembled glycoprotein that can be reassembled into nanostructures. These proteins can reassemble in vitro into self assembled Slp monolayer (SAM) on the surface of a broad spectrum of materials. Native bacteria were isolated from thorium ore samples obtained from Indian Rare Earths Limited (IREL), Manavalakuruchi, India using enrichment culture technique. Among the 11 isolates, the bacteria MVK04, exhibited maximum uranium resistance upto 585 ppm and 600 ppm at pH 4.0 and 7.0 respectively. The HRTEM image and EDAX spectroscopy of uranium exposed cells clearly showed the precipitation of uranium crystals in the outer membrane of the isolate having S-layer proteins. Surface layer protein was extracted from this isolate and the Slp protein monomers were purified and reassembled to form nanostructures on glass slides and carbon coated copper matrices. Reassembly of the S-layer protein was studied using 10mM CaCl2 and monomer formation was studied using 2mM EDTA. The AFM and HRTEM images clearly indicated that the proteins exposed to CaCl2 have the tendency to reassemble whereas the same protein when exposed to EDTA formed agglomerates and remained monomers. Bacterial resistivity against uranyl salt and its interaction with S-layer proteins was compared with Bacillus subtilis (MTCC 2422) and Bacillus stearothermophilus (MTCC 1518) as reference.

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