National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Biofilm developmental dynamics and multimetal remediation efficacy of a marine bacterium Pseudomonas aeruginosa CSA06P
Speaker	: Trisnehi Pradhan (523ls6010)
Supervisor	: Santosh Kumar #2787
Venue	: LS Seminar Hall
Date and Time	: 09 Dec 2024 (16:00 hrs)
Abstract	: Bacterial biofilms serve as imperative agents in the bioremediation of heavy metals, offering a sustainable approach for heavy metal remediation. The present study explores the potential of marine bacterium Pseudomonas aeruginosa CSA06P, isolated from Chilika lake, Odisha, India, which formed robust biofilm in presence of Pb (II), Cr (VI), and Hg (II). Confocal laser scanning microscopy and phase contrast microscopy revealed distinct biofilm developmental stages, with the isolate achieving maximum biofilm thickness (16.21±0.4521 μm) and the largest cell sizes (inner cells: 0.707 μm; outer cells: 0.97 μm) at 48 hours. SEM analysis showed that the irregularly surfaced, rod-shaped cells formed loosely packed aggregates encapsulated within dense extracellular polymeric substances (EPS) under multi-metal stress. FESEM-EDX confirmed metal sequestration by EPS, which increased the EPS surface crystallinity (CIxrd= 0.179). ATR-FTIR analysis indicated interactions of metal ions-functional groups (–C≡C, C=O in COO-, N-H), and ^{1}H NMR revealed metal binding to the ring proton region of carbohydrates. Biofilm mode achieved enhanced multi-metal sequestration with a removal efficiency of 97.99% [Pb (II)], 41.8% [Cr (VI)], and 59.92% [Hg (II)]. This study highlights EPS-metal interaction and potential of Pseudomonas aeruginosa CSA06P for effective biofilm-based metal remediation in contaminated marine environments. Keywords: Pseudomonas aeruginosa CSA06P, Extracellular polymeric substance (EPS), EPS-metal interaction, bioremediation