Geophysical Research Abstracts,
Vol. 11, EGU2009-12851-1, 2009
EGU General Assembly 2009

Monitoring of biofilm growth in marine sediment by metal electrodes

P. Cristiani (1), R Guandalini (1), P. Del Negro (2), and B. Cataletto (2)

(1) CESI RICERCA, Environment and Sustainable Development Department, Milan, Italy (pierangela.cristiani@cesiricerca.it), (2) Istituto Nazionale di Oceanografia e di Geofisica Sperimentale OGS, Biological Oceanography Department, Trieste, Italy (pdelnegro@ogs.trieste.it)

Electrochemical monitoring of biofilm growing in marine sediments is evaluating in laboratory experiments, still in progress. The interesting preliminary results obtained during six month experiments are presented in this paper. A concept of electrochemically active bacteria has recently pointed out by several studies, showing that bacteria forming biofilms on conductive materials can achieve a direct electrochemical connection with the substrate using it as electron exchanger, also without the aid of additional mediators [1]. The electric current generated by bacteria is more than enough as signal for bio-sensors. Thanks to the developing of bio-sensors based on electrochemical probes and able to monitoring the biofilm growth on metal surfaces, this “bio-electricity” has been already exploited with success for the biofilm monitoring in industrial equipment exposed to natural waters [2].
The same, very simple, electrochemical biofilm probes, in which electrical signal is proportional to biofilm growth, already successfully used for aerobic environments, have been here tested in the anaerobic environment of marine sediments.
A laboratory microcosm has been prepared by filling a large polycarbonate cylinder about one-third full with organic-rich coastal marine sediment collected in the Gulf of Trieste (Northern Adriatic Sea). The sediment was packed tightly in the container to avoid entrapping air and then covered with O2 depleted seawater. Three identical electrochemical sensors were buried in the sediment of microcosm. The cylinder was placed in the dark under controlled temperature and anaerobic conditions. During the six months of monitoring, bacterial communities developing at the water-sediment interface were periodically sampled by inserting a long thin pipette into the column and removing some coloured mud or water. The microrganisms were used to inoculate enriched media and to extract bulk DNA.
The results pointed out the possibility of set up simple device able to monitor biological activity under anaerobic-aerobic condition, in remote sea bed.

1) D.R. Bond, D.E.Holmes, L.M. Tender, D.R. Lovley, Electrode-reducing Microorganisms That harvest Energy from Marine Sediments, Science Vol.295, 18 Jannuary 2002.
2) A. Mollica A, P. Cristiani Water Sci. Technol. 47(2002): 45.