DEMINE
Decreasing the Impact of Abandoned Mines

Accepted abstract for the SETAC Europe 29th Annual Meeting. Helsinki, Finland, 26-29 May 2019.

Biofilm communities as indicators of ecological impacts caused by treated and untreated abandoned mine effluents

Lorenzo Proia, Lidia Vendrell, Meritxell Abril, Marta Ricart, Joan Colon, Sergio Ponsà, Laia Llenas.

BETA Technological Center, University of Vic - Central University of Catalonia, Spain. e-mail contact: lidia.vendrell@uvic.cat

Mining activities have been performed since the Bronze Age and produce huge amounts of waste because the ore is a small fraction of the total volume of the mined material. Wastes produced by mining may reach surface waters both directly by effluent discharge and/or indirectly by seepage through embankments. About the 70% of the metal and salt mines in EU countries are classified as "abandoned" and represent an uncontrolled source of chronic pollution to receiving freshwater bodies because of the lack of any regulation about wastewaters treatment. The specific hazards posed by chemical stressors harboured in mine effluents to the aquatic environment mainly depend on its fate which influence its bioavailability and ecotoxicity. Biofilms are complex microbial communities with a relevant role in aquatic ecosystem functioning that are considered as effective bioindicator of ecological impacts and are recognized as necessary target within the Water Framework Directive. This study aims to evaluate the efficiency of an innovative treatment technology based on membranes and electrocoagulation (developed in the framework of the Life DEMINE project) for the reduction of the ecological impacts generated by metals and salts abandoned mines. Two different experiments have been carried out under controlled conditions in microcosms to evaluate the ecological impacts of a) metal and b) salt mine effluents treated with different technologies using natural biofilm communities as bioindicators. Specifically we compared the behavior of control biofilm communities with the responses observed after a two weeks addition of water coming from mine effluents untreated (U) and treated with membranes (M), Electrocoagulation (E), Electrocoagulation after membranes (F) and a mix of water coming from M and F that would be the final effluent (EF) of the innovative technology developed. Untreted mine effluents (U) significanlty affected river biofilms by reducing its photosynthetic efficiency and phosphorus uptake rates whereas treated effluents barely provoked biological responses that, when observed, were generally recovered. Finally the metal mine untreated effluent caused significant changes of the phototrophic biofilm compartment which shifted from diatom to green alge dominated community. This study demonstrated that the innovative technology developed in the Life DEMINE project significantly reduces the ecological impacts caused by abandoned mine effluents on biofilms.