Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.6217

Deciphering the Molecular Interaction of *Stenotrophomnas bentonitica* with Eu^{III}/Cm^{III} Related to the Safety of Future Deep Geological Repositories of Nuclear Wastes

MARCOS FELIPE MARTÍNEZ-MORENO[1], MIGUEL ANGEL RUIZ-FRESNEDA[1,2], MARGARITA LOPEZ-FERNANDEZ[1,3], ANDREA CHERKOUK[3], YON JU-NAM[4], JESUS JAVIER OJEDA-LEDO[4], HENRY MOLL[3] AND MOHAMED L. MERROUN[5]

[1]Department of Microbiology, University of Granada
[2]Crystallography and Structural Biology Department, Centro Superior de Investigaciones Científicas (CSIC)
[3]Helmholtz-Zentrum Dresden-Rossendorf, Institute of Resource Ecology
[4]Swansea University
[5]Department of Microbiology, Faculty of Sciences, University of Granada

Presenting Author: mmartinezm@ugr.es

Deep Geological Repository (DGR) is the most internationally accepted option for the final management of high-level radioactive waste. This type of storage is made up of a multibarrier system including natural and artificial barriers. For instance, bentonite clay barriers will work as a filling and sealing material. One of the criteria for evaluating the safety of DGRs is the determination of the radionuclides isolation capacity. Therefore, an important factor to be considered is the influence of microorganisms in the mobility of these pollutants. Microbial communities occurring in bentonite can influence the migration behavior of radionuclides such as curium (Cm^{III}). This work shows the molecular interactions between *Stenotrophomonas bentonitica* (a bacterium isolated from Spanish bentonites) with Cm^{III} and its inactive analogue europium (Eu^{III}) at environmentally relevant concentrations.

Potentiometric studies showed the great potential of *S. bentonitica* for metals binding due to the high concentration of phosphates in its cell wall compared to other bacterial strains. Different spectroscopy techniques [Infrared (ATR-FTIR) and X-ray photoelectron (XPS) spectroscopy] revealed the role of phosphates and carboxylate groups from the cell surface in the bioassociation of Eu^{III}. Furthermore, time-resolved laser-induced fluorescence spectroscopy (TRLFS) identified phosphoryl and carboxyl groups from *S. bentonitica* surface as released complexing agents that were involved in the Eu^{III} and Cm^{III} coordination.

For these reasons, plus the ability to form biofilms on the bentonite material, *S. bentonitica* is considered as a potential candidate to carry out trivalent actinide immobilization processes increasing the safety of future DGR systems [1].

[1] Ruiz-Fresneda, M.A.; Lopez-Fernandez, M.; Martinez-Moreno, M.F.; Cherkouk, A.; Ju-Nam, Y.; Ojeda, J.J.; Moll, H.; Merroun, M.L. (2020). *Environ. Sci. Technol.*, 54, 15180-15190.