

## ***Chemical Speciation of Europium Associated with Marine Bacteria***

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### **Abstract**

The main aim of this work is to elucidate, at molecular scale, the interactions mechanisms of the marine bacterium *Idiomarina loihiensis* MAH1, with trivalent lanthanides (e.g. europium) as inactive analogues of trivalent actinides (curium and americium) using a multidisciplinary approach combining spectroscopic (Time-Resolve Laser-Induced Fluorescence Spectroscopy, TRLFS) and microscopic (High Resolution Electron Microscopy, HREM) techniques. The strain MAH 1 was isolated from Alboran Sea [1], where the radioactive waste transport is intense leading to the environmental release of actinides. These speciation studies were performed using two type of background electrolyte, NaClO<sub>4</sub> (at 0.1 M) and seawater (natural habitat of this bacterium). TRLFS analysis indicated that the speciation of Eu(III) associated with the cells of MAH1 depend on the type of electrolyte. In the case of NaClO<sub>4</sub>, the lifetime (313-321 μs) of the Eu complexes formed by MAH1 at pH 5 and 7 are characteristics of those of Eu/carboxyl group's complexes indicating the involvement of these bacterial functional groups in the coordination of Eu(III). HRTEM analyses showed that Eu accumulates were located at cell wall and within the extracellular polysaccharide (EPS) characteristic of this bacterium. However, the cells of this bacterium precipitate Eu(III) as Eu carbonates species when the cells are suspended in seawater with two different Eu concentrations (10<sup>-5</sup> and 10<sup>-4</sup> mM). TEM analysis indicated that these Eu carbonates precipitated were localized only at the cell surface.

The present work highlights the role of marine bacteria in the geomicrobial processes of trivalent lanthanides and trivalent actinides occurred at marine environments and the role of these microbes in the fate and mobility of these inorganic contaminants in marine ambients.

[1] González-Munoz M.T., De Linares, C., Martínez-Ruiz, F., Morcillo, F., Martín-Ramos, D., Arias, J.M. *Chemosphere* 72, 465-472 (2008).