

Impact of metal contaminants from an alumina plant effluent in seawater (Mediterranean Sea)

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Since the 60's, the residues (red muds) of the aluminium extraction from bauxites produced during the Bayer process operated by the ALTEO alumina plant (Gardanne, Southern France) have been disposed in the Cassidaigne submarine canyon (Mediterranean Sea) near the Calanques National Park. New regulations in force since January 1, 2016 do not allow any longer the disposal at sea of a slurry, but only that of a high pH clarified liquid effluent obtained by filtration of the Bayer residue. The solid part of the waste is now stored in on-land tailing ponds. The authorization for these new operational conditions have been delivered for a 5-year period during which the ALTEO Company is committed to study the environmental aspects of this disposal. In the framework of this project, we have determined the chemical composition (major and trace elements) of this effluent (Na-Al-OH, pH = 12.5, TDS of 1.5 g/L) and that of waters samples collected at sea in the zone of discharge. A mineralogical study (X-rays, SEM, microprobe) has shown that the concretions formed at the outfall when the effluent mixes with seawater are predominantly made of hydrotalcite (a Mg-Al double layered hydroxide containing carbonate) with minor Ca-carbonates and Al-Fe hydroxides. The capacity of the hydrotalcite to store and release trace metals has been investigated during lab experiments and compared to the metal contents of water samples collected at sea in the water column. The stability of the hydrotalcite has also been studied through dissolution/precipitation experiments. This work is part of an on-going investigation of the dynamics of trace metal contaminants and their impact on marine ecosystems in urbanized/industrial mediterranean coastal zones.