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Use of organic aragonite shells for the removal of aqueous metals in polluted soils and waste waters

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In the present study we propose the use of coupled precipitation/dissolution processes for metal (Me) removal from polluted soils and waters by biogenic carbonate ($CaCO_3$) shell surfaces according to the following overall reaction: $CaCO_3$ + Me^{2+} $\leftrightarrow$ $MeCO_3$ + Ca^{2+} . This process has the potential of being used in three different areas of water treatment: a) Use of shells as a cheap and effective geologic barrier for contaminated ground or surface waters, b) Use as a material in filter beds or fluidised bed for selective cleaning of waste water with the potential of partial metal recovery and

c) Use as seed crystals during the elimination of metals through precipitation with soda (Na_2CO_3). This method is used to remove harmful heavy metals like Pb, Zn, Fe and Cd from waste waters.

Biogenic shells are a waste product in many coastal countries and may thus be more favourable than other solid phases such as clays or zeolithes from an economic viewpoint. Our metal elimination study aims at setting up a low-cost effective elimination system for various types of metal rich waste waters.

A number of experimental techniques such as batch, column and flow through reactors were used to optimize the metal removal efficiency in both synthetic and waste waters from the metal finishing industry. We varied solid liquid ratio, initial and final pH, metal concentration and combination of metals. Measurements of pH, metal con-

centration, conductivity and alkalinity were recorded over the time. Metal content of Fe, Zn and other heavy metals of the precipitate from the different reactors systems were characterized using FT-IR spectroscopy, X-ray diffraction, scanning electron microscopy (SEM) and Raman Spectroscopy. The most important factors that influence metal removal efficiency, experimental setup, the total iron content, reaction pH, metal to shell ratio will be discussed.