



Investigation of Rare Earth Elements and Lead Isotopes on Waste Water from Textile Mills

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Rare earth elements (REEs) and Pb isotopes are two common tracers used in geoscience. However, REEs can indicate some important chemical environments, such as redox state and sorption process as well as lead isotopes is capable of indicating the sources of lead. In this study, both of them were applied on the wastewater from a textile mill in Taiwan for evaluating the dominant reactions along the wastewater treatment system. The wastewater samples were collected at the outlet of sedimentation and aeration pool, activated sludge pool, and chemical precipitation tank. In addition to REEs and Pb isotopes, the inorganic components of water were also measured with ICP-MS. The results of REE analysis demonstrate that the original wastewater shows a similar pattern with sedimentary rock. After the treatment of activated sludge process, the REE patterns were significantly modified: (1) Heavy REEs became highly enriched, which obviously results from the preferable adsorption of light REEs on the surface of activated sludge due to the smaller hydrated light REEs. (2) The Ce negative anomaly can be observed, which indicates that the oxidation reactions may become considerable due to the redox increasing. (3) The Eu positive anomaly is predominant. However, Eu positive anomaly generally represents a reducing environment, which is inconsistent with the derivation from Ce negative anomaly. Therefore, it is concluded that the wastewater treatment with activated sludge is strongly controlled by adsorption process. On the other hand, the lead isotopic ratios are scattered in a wide range. It demonstrates different kinds of anthropogenic sources.