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Water Quality Assessment of Jose Antonio Alzate Dam, the Lerma River and Its Tributaries in the State of Mexico, Mexico

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ABSTRACT

Water quality was evaluated at sites of the Jose Antonio Alzate Dam, the rivers Lerma, Tejalpa and Temoaya in the State of Mexico, Mexico. The variables measured included pH, conductivity, temperature, dissolved oxygen (DO), ammonia, nitrates, sulfates, sulfides and metal concentrations (Cu and Pb). Chemical speciation for dissolved metals in the aqueous phase was obtained using measured concentrations and the software MINEQL+ (4.5); metal partition coefficients was also obtained using dissolved and particulate concentrations of metals. Hydraulic behavior of the studied water bodies was investigated and the fate of Cu and Pb ions was simulated. The simulation results indicate that the Lerma River provides the majority of organic matter and metal contaminants as a result of a poor oxygen saturation velocity, and showed a slight improvement when the Lerma River is subjected to its tributaries Tejalapa and Temoaya Rivers. Under the reducing conditions predominating along the dam and from the results of aqueous phase chemical speciation, it was found that sulfide metal-associated species are the ones that predominate. It was demonstrated that in general, the rivers Tejalapa and Temoaya presented the best water quality. The Lerma River oxygen saturation improves after the rainy season, but it worsens during the dry season. Due to irregular topography, the small slope prevailing in the Lerma River, and the almost nonexistent water flow, zones with different characteristics are formed within the dam. The sedimentation contributes in the generation of local eddies causing the existence of a small diffusive flow. The order of partition coefficient was $Pb > Cu$. Cu presented the highest risk levels in the dissolved phase.

KEYWORDS

Water Quality; Copper; Lead; Partition Coefficients; Chemical Speciation

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