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The role of tailing colloid on the migration of vanadium in porous media

YI HUANG, ZIJING LI, GANGHUI JIAO AND LI WANG

Chengdu University of Technology

Presenting Author: huangyi@cdut.edu.cn

Tailing is a byproduct of the mining process and generally stored in the tailing dam in the form of original accumulation for a long time, causing serious waste of resources and ecological environment pollution. The environmental risk caused by the migration of colloidal particles from tailing to surrounding soil cannot be ignored, since colloidal particles always carry a large amount of heavy metals, and migrate in porous media at a faster rate and longer distances than metal ions. However, research data on the interaction and migration of tailing colloids and heavy metals are lacking. In this study, to investigate the leaching behavior of vanadium (V) in vanadium-titanium magnetite tailing, and to figure out whether the vanadium-titanium magnetite tailing colloid affects the migration of V in porous media, the leaching law of V from vanadium- titanium magnetite tailing under different physical and chemical conditions, as well as the interaction and migration mechanism between tailing colloid and V were studied. The total content of V in the tailing was detected to be relatively high while the leaching concentration of V in tailing to be relatively low. Ultrasonic dispersion was applied to prepare tailing colloid, and batch experiments showed that tailing colloid could adsorb V. The results of migration experiment demonstrated that the effect of pH and ionic strength (IS) on the co-migration of tailing colloid and vanadium in porous media was consistent with that of single-migration. As pH increasing and IS decreasing, tailing colloid and vanadium were more easily to migrate from porous media. Tailing colloid accelerated the migration of V, but reduced the mass of V migration. On the contrary, V increased the mass of tailing colloid migration, but had no effect on its migration rate. This study enriches the single and co-migration data of V and tailing colloid in porous media, to provide a reference for scientific assessment of the environmental risks of tailing ponds.