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Evaluation and microanalytical study of ZVI /scoria zeolite mixtures for treating acid mine drainage using reactive barriers - removal mechanisms

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Highlights

ZVI – zero valent iron, VS – volcanic scoria zeolite, AMD – acid mine drainage

- VS removes heavy metals from AMD even at relatively a low pH not exceeding 5.5.
- 50% ZVI and 50% VS mixture removes most inorganic contaminants from AMD except Mg and Mn.
- Upon reacting with AMD, ZVI forms Hematite and Goethite while VS forms Forsterite and Ferroan.
- Removal mechanisms are chemical precipitation for ZVI; adsorption and cation exchange for VS.

Abstract

Batch and column experiments were performed to evaluate contaminant removal from acid mine drainage (AMD) using volcanic scoria zeolite (VS) with or without zero-valent iron (ZVI). Two sources of AMD were used, comprising WZ from a gold mine and TDB from a coal mine. Both the WZ and TDB were acidic mine water with pH values of 2.43 and 2.93, respectively. It was found that VS was effective in removing heavy metals from AMD despite attaining a relatively lower maximum pH of 5.5, compared to the pH values of 7.0 to 8.5 attained using ZVI. The reactive media VS, ZVI, and 50:50 ZVI-VS all achieved effective removal of Al, Fe, Zn metals. The mixture 50:50 ZVI-VS gave the best contaminant removal performance, relative to the other reactive media used in the investigation.