Title: Iron Foundry Slags for Removing Arsenic from Water

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Summary:

This paper describes findings from leach testing, total element analyses, and kinetic batch tests conducted to evaluate the feasibility of using iron foundry slag (an industrial byproduct of iron casting) as a reactive material in permeable reactive barriers used to remove arsenic (As) from groundwater. Tests were conducted on four slags from foundries in Wisconsin using solutions containing arsenite (As-III) and arsenate (As-V) having initial total As concentrations ranging from 100-2500 μg/L. Comparative tests were also conducted on zero valent iron (ZVI) and sand as a non-reactive control. Water leach testing and total elemental analyses suggested that leaching from slags is not appreciably different from ZVI, at least in the context of environmental regulations in Wisconsin. For the same liquid-to-solid ratio, As removal was slower with slag than ZVI. Arsenic removal rates also varied considerably from slag to slag, and did not depend on the quantity of iron in the slag. The removal rate typically decreased with increasing concentration, and was slower for As-III than As-V. Computations made using the rate coefficients measured in this study suggest that a common 1-m-thick PRB containing iron foundry slag could effectively treat groundwater contaminated with As-III or As-V at a concentration of 1000 μg/L, although other factors such as slag heterogeneity and competition with other species might influence effectiveness in a field setting.
Related Publications:

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Metz, S. and Benson, C. (2007), Iron Foundry Slags as Permeable Reactive Barriers Materials for Removing Arsenic from Groundwater, Proceedings, GeoDenver, American Society of Civil Engineers, in press.

Key Words: arsenic, groundwater, permeable reactive barrier, iron, slag, beneficial use

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