



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002MO3B

Title: Development of Wax-Rich Grout for Borehole Sealing

Project Type: Research

Focus Categories: Water Quality, Groundwater

Keywords: Wax-Rich Grout, Borehole Sealing, Wells, Permeability

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Federal Funds: \$22,000

Non-Federal Matching Funds: \$58,389

Congressional District: Missouri 8th

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Abstract

It is estimated that there are approximately 500,000 abandoned and/or unsealed water wells in the state of Missouri. Unsealed wells can act as pathways for contaminants to reach potable water supplies. However, this is only a part of the problem. Water wells have traditionally been sealed with conventional cement or bentonite cement grouts. Recent research has suggested that conventional grouts do not provide adequate seals to prevent contaminant migration. In recognition of this problem the U.S. Department of Energy recently funded several projects aimed at developing more effective grout and grouting procedures. The purpose of this seed project is to test a mixture of food-grade wax and ground glass for use as grout. Previous DOE funded research has tested a mixture of montan wax (a naturally-occurring wax) and montmorillonite clay. Our preliminary laboratory testing of food-grade wax and montmorillonite showed us that this material tends to slake when exposed to water, and that food-grade wax mixed with ground glass does not. Slaking of grout when exposed to water is undesirable. Ground glass also imparts greater strength to the wax-rich grout than montmorillonite clay. Thus this grout should have more extensive applications than just the sealing of water wells. It may also prove useful for geotechnical applications where greater strength is required.

Our preliminary tests suggest that the permeability of a wax-glass grout should be significantly lower than that of a wax bentonite mixture or conventional grout (by at least several orders of magnitude). Thus wax-glass grout may have significant applications in sealing water and gases out of tunnels or radioactive waste disposal sites such as Yucca Mountain, NV.

One problem with organic materials is potential susceptibility to microbial degradation. While addressing this aspect is not within the scope of this initial research, the addition of materials toxic to microbes, but non-toxic to humans may prevent microbial degradation of the wax if it proves to be a problem. Such compounds exist. For example, the New Mexico Tech Research Foundation recently patented a compound that prevents biologic attack on insulation and other materials. The PI's communications with the New

Mexico Tech Research Foundation indicate that some of this material can be made available for testing for use in wax-rich grout.

The purpose of the proposed research is to perform the preliminary investigation of the permeability and sealing ability of wax-glass grout in order to establish the feasibility of this material for use in sealing abandoned water wells, boreholes and for other applications. Both food-grade wax and glass are inexpensive, and it is anticipated that the cost of sealing with the wax-glass grout will be comparable to conventional grouting costs.