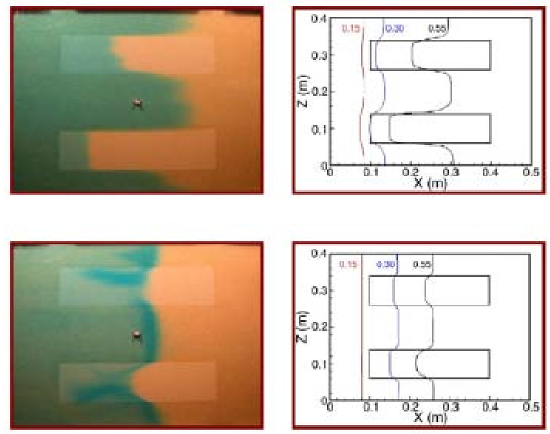
Nuts about Gum

Xanthan gum gives positive results in remediation studies

Remediation efforts are often incomplete and laborious because of subsurface contaminants located in hard-to-reach places, such as areas of low permeability in aquifer systems. Using resources at the Department of Energy's EMSL, a Pacific Northwest National Laboratory team found a way to enhance cleanup effectiveness and efficiency by incorporating the inexpensive and readily available polymer, Xanthan gum, into the remediation process.



Xanthan gum (lower left) helps remediating agents reach areas of low permeability as compared to a control (upper left) in flow cell experiments (permeated volume shown in blue). STOMP predicts the experimental results well (right).

Using flow cell experiments, the research team simulated the remediation of contaminated areas. The team found that adding Xanthan gum to remediating solutions increased their viscosity, thus helping deliver the remediating agent to areas in which the contaminant may otherwise have been left behind and increasing the portion of the contaminated volume touched by the remediating agent. Further, a version of the Subsurface Transport over Multiple Phases simulator – a general-purpose tool developed by PNNL scientists for simulating subsurface flow and transport – that was modified to account for using the polymer in the system accurately predicted the results of the experiments. The modified version of STOMP may be used to predict subsurface remediation performance in similar systems at larger scales, and the Xanthan gum additive may prove useful in real-world scenarios such as cleanup of uranium-contaminated areas.

The team's work has led to a Department of Defense Environmental Security Technology Certification Program project, *Enhanced Amendment Delivery to Low Permeability Zones of Chlorinated Solvent Source Area Bioremediation*. For this project, PNNL researchers are collaborating with colleagues from GSI Environmental.

Scientific impact: The team's advances in remediation research demonstrate the feasibility of an inexpensive alternative remediation technique and of using computational tools to predict the effectiveness of such techniques under real-world conditions. In addition, this research supports EMSL's goal to link theory with experiment.

Societal impact: Advances in remediation research may lead to improved remediation techniques, positively affecting the environment and human health.

For more information, contact EMSL Communications Manager Mary Ann Showalter (509-371-6017).

Reference: Zhong L, M Oostrom, TW Wietsma, and MA Covert. 2008. "Enhanced remedial amendment delivery through fluid viscosity modifications: Experiments and numerical simulations" *Journal of Contaminant Hydrology* 101:29–41.

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