

CO₂-Responsive Polymeric Fluids as Greener Fracturing Fluids for Fossil and Geothermal Energy Recovery

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Thursday May 16, 2024, 9:00 a.m. Central Time



Dr. Carlos Fernandez, a chief scientist and team lead at Pacific Northwest National Laboratory, will speak on Thursday, May 16, 2024, at 9:00 a.m. Central Time.

The topic is “CO₂-Responsive Polymeric Fluids as Greener Fracturing Fluids for Fossil and Geothermal Energy Recovery.” Collaborators include Guoqing Jian, Jeffrey Burghardt, Alain Bonneville, Varun Gupta, Susan Petty, Trenton Cladouhos, and Geoffrey Garrison

Abstract

StimuFrac (US Patents 9,447,315B2 and 9,873,828 B2) is a stimulation fluid technology that consists of a polymer aqueous solution that undergoes CO₂-promoted volumetric expansion triggered by temperature. StimuFrac is distinctly different from conventional polymer systems used in hydraulic fracturing operations because it is the only technology based on 1) unique and controlled CO₂-triggered volume expansion, 2) reversible (by pressure swing) viscosity, and 3) non-toxicity and high thermal stability (up to 400C). StimuFrac is also different from propellants because, although it undergoes a chemical reaction with CO₂, it does so at significantly lower rates (20-40s) and the reaction is reversible. During this presentation we will present the latest lab-scale experimental and simulation results on StimuFrac including permeability enhancement ability as compared to other water and waterless fluids, proposed mechanism for its performance, and injection strategy towards field deployment.

Biography

Dr. Carlos A. Fernandez is a chief scientist and team lead at Pacific Northwest National Laboratory with over twenty years of experience in industrial and governmental R&D. Before joining PNNL, he worked as a researcher and consultant for the industry sector in the Center of Excellence for Products and Processes of Cordoba, Argentina. Since joining PNNL in 2006, Dr. Fernandez research has focused on the engineering of nanomaterials, cement and concrete composites, and smart fluids for environmental and energy applications. He has managed several multi-institution projects funded by the DOE's Energy Efficiency and Renewable Energy with a total funding volume of \$15 million in the past five years.

As of 2024, Dr. Fernandez has over seventy publications (H Index 24), eight patent applications (six awarded), and is an editorial board member of Nature's Scientific Reports. His research has been featured in several press releases including Energy.Gov, C&E News, Chemistry World, Scientific American, NBC Right Now, and ten journal covers. Dr. Fernandez's work on StimuFrac™ was recognized as a potentially game-changing technology on C&E News and awarded with the Institute of Chemical Engineers 2015 Global Award for Outstanding Achievement in Chemical Engineering. Dr. Fernandez's work on self-healing cements obtained a 2020 R&D100 Award and a Silver medal for green technology.