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Emulsion Stability in Oil Extraction: X-ray Microscopy Studies

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Introduction: The mechanisms behind colloidal stability and interparticle interactions are important for many aspects of the heavy oil and oil sands industries in dispersions separation, froth flotation, wastewater treatment, flow of slurries, emulsification, and demulsification. Wet cell microscopy in the Scanning Transmission X-ray Microscope (STXM) can be used to image these emulsions, providing a combination of spatial resolution and chemical sensitivity that is unavailable with other microscopies.

Results: We have used the SUNY-SB STXM microscope to map the absorption of oil onto clay particles in these emulsions (see figure 1). The clay particles stabilize these emulsions through a complex surface and interfacial chemistry. Wet cell microscopy allows us to resolve the organic, clay and water phases, as well as the association of carbon onto the clay particles. Microspectroscopy allows us to chemically distinguish between the oil phase (primarily aliphatic) and the adsorbed carbon (some aromatic character) in these emulsions. Further studies to elucidate the role of these clays and specific organic components (such as asphaltenes) in the stabilization of these emulsions are under way.

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