

Photographing Floods: Imaging Fluid Flow

Kenneth Lyons, Jr.¹, Amber T. Krummel², David A. Weitz²

¹Morehouse College, ²Harvard University

How do you increase the production of oil? One way is to evaluate the extraction techniques. Two techniques inject a liquid into the well to push out oil: water flooding and polymer flooding. To push oil, the injected liquid must *not* be able to mix with oil. An excellent way to evaluate efficiency of the techniques is to image the system while the liquid pushes the oil. An image can give insight on the workings of the two extraction techniques and perhaps ways to improve them.

Individually, water and the polymer solution will be flowed in a system mimicking how these solutions would interact with oil in an oil well. (Figure 1) An image is then taken by focusing on the border between the fluid and the oil. (Figure 2) There is evidence in the literature to support the idea that water flooding and polymer flooding work differently. Images of the flooding may validate this idea.

The most significant difference between a polymer solution and water is their viscosities. Viscosity, how slow a liquid flows, depends on the forces within the liquid. A polymer's structure gives it greater inner forces. (Figure 3) With images, it maybe possible to determine the exact effectiveness of polymer flooding.

Supported by NSF DMR-0649199

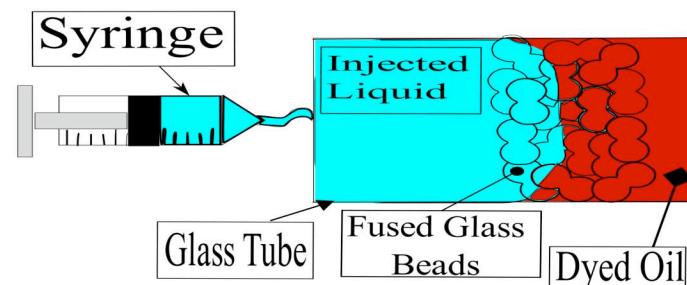


Figure 1 -The System: composed of a glass tube filled with fused glass beads flooded with oil with a fluid injected

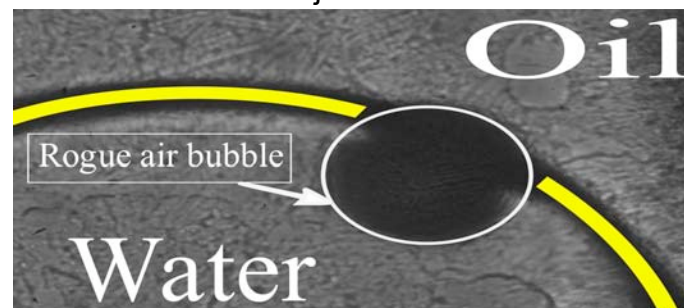


Figure 2- Interface: The interface between water and oil is marked in yellow.



Figure 3 - Structure: Water molecules weakly attract each other. Monomers, the molecules making up polymers, are linked together.