

# Chasing Tack in Polymer Gels

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**Chemistry  
Seminar on  
Polymer Gel**

**Monday  
Oct 17 at 4 pm  
in 303 Schrenk**

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**Abstract:** Polymer gels are utilized for many applications: fuel cell membranes, ion exchange resins, super absorbent baby diapers, and, in our research, conformance control of eroded or fractured petroleum wells. Polymer gels are insoluble, crosslinked structures that can reduce permeability of otherwise open flow passages and, by disallowing water from flowing through the lease-resistance path, increases oil production by making water floods push oil rather than merely flow through unobstructed paths. The ability to redirect water to push oil is known as conformance control. Gels are made in water solution as bulk gels, resulting in a huge mass of water-swollen, crosslinked polymer. The bulk gel is dried and particulated to specific size distribution to produce what is known as preformed particle gels (PPG). These are redispersed into water and pumped into petroleum wells. The particles swell and their swollen mass sticks in pore channels, which reduces flow of that channel. Our recent developments have resulted in 6 patent/patent applications associated with compositions of polymer gels for conformance control purposes. In particular, the gel designs cause the swollen particle to display tack such that the particles can reassemble from PPG back into a bulk gel structure. A self-healing, auto-adherent aspect better occludes water channels and improves conformance control and oil recovery efficiency/reducing water cut of recovered fluid. The issue we have been chasing with respect to polymer gels is what enables self-healing, i.e., tack, and how do we design gels of different composition to possess tack? Tack is a polymer property where the polymer material is sticky and polymer chains can entangle in a structural way to develop strength. Plasticization is where polymers are swollen and have mobility and can entangle but not in a structural way; no strength is developed. Our first successful gel utilized a zirconium salt additive that provided tack, reassembly, and a strong bulk-gel-like material. A newly funded project is developing high temperature (300°C) PPG for sealing of geothermal well leakage. I will describe some of our developmental and initial work into the science of tack in polymer gels.