

## عنوان مقاله:

Hydraulic Fracturing Fluids: A Comprehensive Review Focusing on Nanoparticle-Enhanced Fluids

## محل انتشار:

کنفرانس ملی علوم پایه و مهندسی با محوریت اقتصاد مقاومتی و صنعت دانش بنیان (سال: 1395)

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## خلاصه مقاله:

Hydraulic-fracturing fluids are used to break down subterranean formations where oil and gas are trapped. Pad or prepad fluids are first pumped into the formation to generate the fracture geometry. Once the fracture geometry is created, additional fluid containing proppant is used to transport these solid particles into the fractures. Then, the hydraulic pressure is released and the fracture will tend to close. At that stage, the proppant prevents fracture closure and provides a conductive channel for hydrocarbons to flow into the wellbore. Biopolymers, synthetic polymers, foams, viscoelastic surfactant (VES) fluids, and slickwater are all used as fracturing fluids, each with properties that are beneficial under certain conditions. Today, their formulations are well developed, and more recently, may incorporate small-sized particles in the nanometer size range. Such nanoparticles have addressed certain technological limitations of fracturing fluids. For example, VES fluids were reported to suffer high leakoff rates in moderate permeability reservoirs and were limited in temperature. Another challenge is the pressure-dependent behavior of borate crosslinked gels, where the viscosity was found to drop significantly under high pressures. Also, in high-temperature reservoirs, it is very challenging to design a fluid that can sustain enough viscosity for a required period of time. Synthetic polymers are commonly used and have been reported to be used at high concentrations. High polymer loading increases the potential of formation damage caused by the fluid residue. These challenges, which can be addressed by nanotechnology, could have a major impact on hydraulic-fracturing applications. This review paper will capture all of these aspects and summarize the most recent experience of nanoparticle usage in hydraulic-fracturing fluids design.

## کلمات کلیدی:

Hydraulic-fracturing fluids, polymer, surfactant, Nanoparticles

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