David Dogon, J Pet Environ Biotechnol 2014, 5:4
http://dx.doi.org/10.4172/2157-7463.S1.006

OMICS Group Conferences
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2nd World Congress on
Petrochemistry and Chemical Engineering
October 27-29, 2014 Embassy Suites Las Vegas, USA

Selective propping of high conductivity fractures

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Controlling fluid transport in the subsurface is important for secondary oil recovery, geothermal heat mining and proppant placement in fractured reservoirs. Limiting fluid loss through fractures in the formation is important for preventing bypassing of oil rich zones. For unconventional gas, larger fractures need to be selectively propped. The process of orthokinetic agglomeration, whereby particles are aggregated by means of fluid shear, has the potential to selectively narrow or block large fractures. This is achieved by coupling the fracture wall shear rate to the fracture size, where higher shear rates in larger fractures result in higher rates of orthokinetic agglomeration. We estimate the differences in shear rate between fracture sizes and perform laboratory investigations on shear-induced particle growth using commercial well mud particulates. Particle growth rates peak at a shear rate of $275s^{-1}$. This maximum shows that it is possible to selectively grow particles based on shear. We also show that the availability of precipitating ions act as "glue" maintaining newly formed agglomerates, suggesting the importance of solution chemistry in the process.

Biography

David completed his BSc. in chemical engineering at the University of Cape Town and his MS in the same field at Columbia University. He is currently pursuing a PhD in mechanical engineering at the Eindhoven University of Technology in collaboration with Royal Dutch Shell. His work focuses on particle flow in fractures with the use of novel fracturing fluids.

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