

Flocculation of Temperature Sensitive polyNIPAM Based Microgels as Switch on Switch off Reservoir Triggers for Enhanced Oil Recovery

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Enhanced oil recovery treatments can be designed to improve reservoir sweep by diverting water flow out of thief zones allowing new flood direction and increasing sweep efficiency. Temperature sensitive poly N-isopropylacrylamide (NIPAM) based microgels in the hydrodynamic size range of 200-600 nm can be used as the basis of a polymer flood system which will switch on and switch off within a reservoir¹.

The temperature induced flocculation of polyNIPAM at a high electrolyte concentration can be used to make a chemical plug to divert the flow of water within a reservoir. Derivatisation of the polyNIPAM microgel (changing hydrophobicity-hydrophilicity) allows for control over the volume phase transition temperature (VPTT) and therefore tailoring flocculation control to the local environmental conditions of a particular reservoir. Temperature triggered flocculation is considered the “switch on” and de-flocculation is considered the “switch off”. This may allow for the chemical plug to be moved and target different areas of a reservoir.

Sand pack tests have tested the ability of flocculated microgels to block the flow of water through a simulated rock environment and also the stability of the flocks at high pressure (>50 bar).

References:

[1] M.J. Snowden, B. Vincent and J.C. Morgan, UK Patent GB 2262117A, 1993.