

# Foams at extreme conditions : high temperature testing for steam foam applications.

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## ABSTRACT

Steam flooding is a thermal technique that can be used to improve oil recovery in reservoirs containing high viscosity oil. However, steam often has a poor volumetric sweep through a reservoir, but this can be improved by introducing a foam, with its associated increase in the apparent viscosity. In our target reservoir, steam has been injected for several years and the temperature in the reservoir close to injection well is very high, in the range 250-275°C. This work therefore aims to determine the viability of several surfactants for steam foam applications at very high temperatures (>250°C). To do this, we investigate: 1) if the candidate surfactants are stable at these high temperatures (250°C and 275°C); 2) if the candidate surfactants are good foamers (in a nitrogen coreflood) at high temperatures (60, 120, 180 and 210°C); and 3) if we can generate steam foam with the most promising surfactants at high temperatures (210, 240 and 250°C). Following the high temperature stability tests, the three most stable candidate surfactants were used in the nitrogen coreflood tests. The measured apparent viscosity was plotted against the injected gas fraction, and a typical set of curves obtained is given in Figure 1, showing the effect of increasing temperature. The most reliable surfactant was then used to carry out steam foam tests at high temperatures, and reasonable foaming behaviour was achieved up to 250°C.

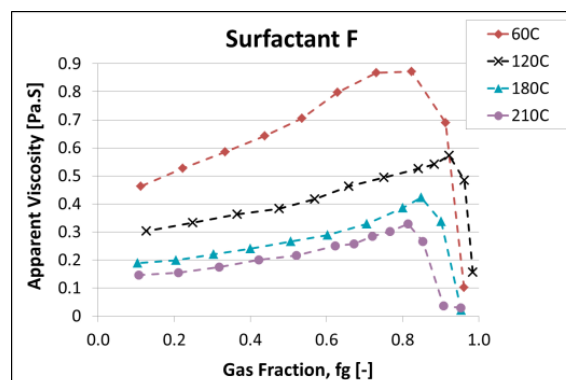


Figure 1: Variation in measured apparent viscosity with respect to gas fraction at high temperatures.