The use of gas in alkaline-surfactant flooding (Alkaline-Surfactant-Gas (ASG) process) can be an alternative to the use of polymer, especially in carbonate reservoirs that generally have low permeability and contain vugs and fractures, for improving the displacement efficiency. In this process foam performs the role of a mobility control agent; thereby ASG can be capable of recovering some of the oil left behind the primary and secondary recovery.

Two approaches were applied to determine the favorable concentration of each surfactant. First; aqueous stability test; where the solubility and stability of surfactant mixture in electrolyte solution are investigated by changing the salinity. The second approach was to evaluated the foam stability and determine the concentration of each surfactant. From phase behavior tests, oil- and water-solubility, it was observed that the phase behavior is oil-in-water micro-emulsion (Winsor Type I Behavior). It is believed that low IFT can be obtained at high solubility ratio for the optimum salinity concentration.

The performance of foam flooding with nitrogen (N2) for oil recovery in limestone carbonate rocks was studied. The success of the ASG process was determined by evaluation of oil recovery, coreflood pressure response and effluent from coreflood experiments. The effects of core permeability, alkaline, and type of surfactants on the performance of the ASG process were evaluated. Maximum recovery of 47.7% of residual oil in place in low permeability was observed compared to 43% of residual oil in place on high permeability. In addition, the more recovery was obtained when using surfactant without alkaline.