Evaluation of Stability and Integrity of Solid Natural Gas Hydrate Pellets Under Self-Preservation and Dissociation Conditions

Sriram Ravichandran [S]
Chemical and Biological Engineering, Colorado School Of Mines, Golden, CO, U.S.A.

Mathias Pohl
Geophysics, Colorado School of Mines, Golden, CO, U.S.A.

Ahmad Majid
Chemical and Biological Engineering, Colorado School of Mines, Golden, CO, U.S.A.

David Wu
Chemistry, Colorado School of Mines, Golden, CO, U.S.A.

Manika Prasad
Geophysics, Colorado School of Mines, Golden, CO, U.S.A.

Carolyn Koh [C]
Chemical and Biological Engineering, Colorado School Of Mines, Golden, CO, U.S.A.
ckoh@mines.edu

The transportation of natural gas is crucial to cater to its demand across the globe. Solidifying natural gas into gas hydrate pellets (otherwise known as solid natural gas, SNG, pellets) can be applied to eliminate the hazards associated with the current LNG and CNG approaches. Specially, natural gas can be transported as SNG pellets at atmospheric pressure and typical refrigeration temperatures (around -5 to -25℃) unlike the conventional approaches that require high pressure / cryogenic conditions. Furthermore, SNG pellets offer an energy density of 164 volumes of natural gas per volume of SNG at STP that can be transported as a non-toxic pellet to remote areas where pipeline construction is economically and physically unfeasibly.

The ability of hydrates to self-preserve at typical refrigerated storage conditions has been experimentally demonstrated. However, there is limited critical information on the physical properties of the pellet pertaining to the self- preservation P-T conditions, such as porosity, grain size, and mechanical integrity of the SNG pellet. In this work, a systematic evaluation of the stability and integrity of SNG pellets under the self-preservation conditions have been experimentally measured over hundreds of hours. These experimental data can be used to evaluate the thermo-physical integrity of SNG pellets under typical storage conditions, which is important in the safety risk assessment of SNG transportation and handling.