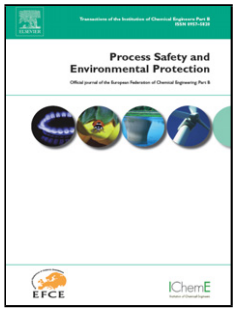

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Numerical analysis of phase behavior during rapid decompression of rich natural gases

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Highlights

1D transient model of gas-liquid two-phase flow in a shock tube is developed

Approach to model the condensation in a compressible gas mixture is proposed

The model is validated on the experimental data on RGD in rich natural gases

Physical reasons form the "condensation plateau" is investigated numerically

Abstract

The effect of the condensation process on the gas and liquid phase behavior during rapid decompression of rich natural gases is studied in the paper numerically. A one-dimensional mathematical model of transient thermal two-phase flow of compressible multi-component natural gas mixture and liquid phase in a shock tube is developed. The set of mass, momentum and enthalpy conservation equations is solved for the gas and liquid phases. The approach to model a liquid condensation process during rapid decompression of rich natural gas mixture is proposed. The mass transfer between the gas and the liquid is taken into account by introducing the appropriate terms into the governing equations. Thermo-physical properties of multi-component natural gas mixture are calculated by solving the Equation of State (EOS) in the form of the Soave-Redlich-Kwong (SRK-EOS) model. The proposed liquid condensation model is integrated into the GDP model. A simple case of GDP model, where the liquid was not considered, was extensively validated on base and dry natural gases. The proposed two-phase