

# **Calorimetry of Methane-Dominant Binary Mixtures at Cryogenic Temperatures and High Pressures for Improved Process Design and Simulation**

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Liquefied natural gas (LNG) is the leading technology for bringing remote natural gas resources to market, and is Australia's only option for participating in the international trade of its significant natural gas reserves. The simulation of LNG processes is crucial because it is the only cost-effective method by which design improvements can be tested. However, the difference between the actual plant operating conditions and those predicted by the simulator are often substantial. The current practice is to over-engineer the plant to compensate for these discrepancies. Unfortunately, this leads to increases in the costs of constructing and running the plant, which may contribute to the development being abandoned. One reason for the inaccurate process simulations is that the equations of state used by the simulator are not tuned to thermodynamic data representative of plant conditions. To address this, we aim to measure a core set of vapour-liquid-equilibria, phase density and calorific data for multi-component fluid mixtures representative of LNG process streams at pressures to 5.5 MPa and temperatures between 110 K and 300 K. In this presentation we describe the modification of a commercial cryogenic calorimeter to measure the volumetric heat capacity at constant pressure,  $c_p$ , of single phase hydrocarbon mixtures over this range of conditions. Results of liquid phase  $c_p(p, T)$  measurements on binary mixtures of methane and {ethane, propane, iso-butane or n-hexane} are reported and compared with literature data.