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C3Po1A-05: Cryogenic binary fluid test bench for studying transport phenomena

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A state-of-the-art binary fluid test bench has been developed enabling advanced experimentation with single and binary fluids across a wide range of thermodynamic conditions. The facility accommodates experiments with all fluid concentrations, ambient temperatures spanning 100 K to 600 K, and pressures between 1 bara and 10 bara. The system features dual inputs for binary gases and a third input to control heating or cooling of the mixture. Comprehensive sensor arrays enable precise thermodynamic mass and energy balance calculations over all inputs and outputs of the reactor. In other words, absolute pressures, temperatures, massflows of all incoming and outgoing lines are monitored. Additionally, it is also possible to probe temperatures at different locations inside the reactor. Furthermore, the setup incorporates optical capabilities to visually observe changes within the reactor, given that a transparant reactor is used.
Designed for versatility, the system supports a broad spectrum of transport phenomena related experiments, including investigations into phase change reactors, heat exchangers, and membrane technologies, with seamless integration of new reactors or components to expand temperature and pressure ranges or explore novel applications. To show its capabilities, a test case will be presented.

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