



Review

CO₂ transport: Data and models – A review

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HIGHLIGHTS

- Data and models for CO₂ transport with emphasis on transient situations are reviewed.
- There are large gaps in thermophysical property data for CCS-relevant CO₂ mixtures.
- A case study with modelling of expansion-tube data for pure CO₂ is presented.
- Data and models for depressurization of CO₂ pipes are needed for safety and operation.
- Non-equilibrium flow modelling and ship transport of CO₂ are also considered.

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ABSTRACT

This review considers data and models for CO₂ transport. The thermophysical properties of CO₂ and CO₂-rich mixtures are needed as a basis for various models within CO₂ capture and storage (CCS). In particular, this is true for transient models of pipes and vessels. Here, the data situation for phase equilibria, density, speed of sound, viscosity and thermal conductivity is reviewed, and property models are considered. Further, transient flow data and models for pipes are reviewed, including considerations regarding running-ductile fractures, which are essential to understand for safety. A depressurization case study based on recently published expansion-tube data is included as well. Non-equilibrium modelling of flow and phase equilibria are reviewed. Further, aspects related to the transport of CO₂ by ship are considered. Many things are known about CO₂ transport, e.g., that it is feasible and safe. However, if full-scale CCS were to be deployed today, conservative design and operational decisions would have to be made due to the lack of quantitative validated models.

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Contents

1. Introduction	500
2. Thermophysical property data	501
2.1. CCS capture product and transport fluid specifications	501
2.2. Data situation for equilibrium properties	501
2.2.1. Vapour–liquid–liquid equilibrium (VLE)	503
2.2.2. Vapour–liquid–liquid equilibrium (VLE)	505
2.2.3. Equilibria involving solids and hydrates	505
2.2.4. Density and related properties	505
2.2.5. Speed of sound	505
2.2.6. Viscosity	505
2.2.7. Thermal conductivity	505
3. Thermophysical property models	505
3.1. Property models for pure CO ₂ and CO ₂ -rich mixtures	506
3.2. Implementation in fluid-dynamic models	507
3.3. Flow through restrictions	507
4. Pipeline transport of CO ₂	508

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