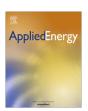


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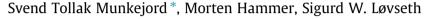
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## Review

# CO<sub>2</sub> transport: Data and models – A review



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- Data and models for CO<sub>2</sub> transport with emphasis on transient situations are reviewed.
- There are large gaps in thermophysical property data for CCS-relevant CO<sub>2</sub> mixtures.
- A case study with modelling of expansion-tube data for pure CO<sub>2</sub> is presented.
- Data and models for depressurization of CO<sub>2</sub> pipes are needed for safety and operation.
- Non-equilibrium flow modelling and ship transport of CO<sub>2</sub> are also considered.

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## ABSTRACT

This review considers data and models for  $\mathrm{CO}_2$  transport. The thermophysical properties of  $\mathrm{CO}_2$  and  $\mathrm{CO}_2$ -rich mixtures are needed as a basis for various models within  $\mathrm{CO}_2$  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  $\mathrm{CO}_2$  by ship are considered. Many things are known about  $\mathrm{CO}_2$  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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