One-dimensional modeling of a turbulent fluidized bed for a sorbent-based CO_2 capture process with solid-solid sensible heat exchange

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A one-dimensional model for a turbulent fluidized bed is proposed and applied to the analysis of a CO_2 capture process using a polyethylenimine (PEI)-silica sorbent. A formula for the contact efficiency was derived from the kinetic equation of the sorbent and the Kunii–Levenspiel core–shell model. Axial profiles of the gas and solid phase CO_2 concentrations and bed temperature were computed, and the energy demand for CO_2 capture was assessed for different degrees of sensible heat recovery.