Dynamic Monte Carlo reactor modeling of calcium looping with sorbent purge and utilization decay

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This work presents a new dynamic modelling approach for calcium looping systems that allows explicit sorbent deactivation and purge/makeup. These are common in plant operation, but often neglected in modeling. This model adopts a Monte Carlo approach, tracking merely 100 particles between the carbonator and the calciner for 60 reaction cycles with the particle residence time in each reactor determined stochastically. The simulated results agree well with the experimental data in both the transient and steady-state stages. This model provides a promising approach to predict the dynamic behaviour of calcium looping systems under relatively realistic conditions at low computational cost.