

Reactive Fluidized bed reactors for high-temperature thermochemical energy storage

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Thermochemical energy storage is gaining attention for high-temperature applications and industrial waste heat recovery. Among thermochemical materials (TCMs), calcium-based TCMs are the most studied and promising due to their high energy storage density. Fluidized beds are preferred for superior heat transfer, but maintaining stable reactive fluidization while achieving fast reaction kinetics and durable conversion presents a major challenge. This study evaluates two CaO–calcium aluminate TCMs, with and without 2 wt% bentonite. These findings demonstrate that binder content optimization is the key requirement for stable TCES operation, serving as a critical trade-off between mechanical resistance and chemical durability.