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CaO加入条件下煤与$CaSO_4$氧载体化学链燃烧的反应性能研究

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Study on chemical-looping combustion of coal with $CaSO_4$ oxygen carrier assisted by CaO addition

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摘要 以小型流化床为反应器、水蒸气为气化介质，在$CaSO_4$氧载体中加入CaO颗粒进行煤气化—氧载体还原反应实验。实验结果表明，添加CaO改善了煤气化—$CaSO_4$还原反应性能，提高了煤气化—$CaSO_4$还原反应速率和CO_2生成速率。但CaO添加剂的催化作用随反应温度的提高而减弱。900 ℃是较适宜的反应温度，此温度下加入适量CaO（CaO/$CaSO_4$物质的量比1.18），气态硫化物释放得到显著抑制，SO_2和H_2S降幅分别为63.19%和27.37%；同时，还能控制CO_2被吸收固化成$CaCO_3$的比例低于2%。

关键词： 化学链燃烧（CLC） $CaSO_4$氧载体 CaO添加剂 气体硫化物抑制 CO_2固化

Abstract: The reactivity between the $CaSO_4$ oxygen carrier with CaO additive and coal under steam atmosphere was studied in a fluidized bed reactor. The experimental results show that the addition of CaO can improve the performance of both coal gasification and $CaSO_4$ reduction, and increase the reaction rate of coal gasification and $CaSO_4$ reduction and the CO_2 generating rate. However, the catalysis of CaO drops as the reaction temperature rises. And the optimum reaction temperature is 900 ℃, at which the releases of gaseous sulfides are remarkably decreased by 63.19% and 27.37% for SO_2 and H_2S, respectively, as the molar ratio of CaO to $CaSO_4$ is 1.18. Meanwhile, the amount of CO_2 absorbed by CaO can be controlled to less than 2%.

Key words: chemical-looping combustion (CLC) $CaSO_4$ oxygen carrier CaO additive suppression of sulfur release CO_2 absorption

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