

碳酸钾催化的铁基氧载体煤催化化学链燃烧

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Catalytic chemical looping combustion of coal with iron-based oxygen carrier promoted by K_2CO_3

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摘要 研究了 K_2CO_3 催化剂及惰性担体对铁基氧载体煤催化化学链燃烧的影响. 实验结果表明, K_2CO_3 的添加可明显促进铁基氧载体与煤之间的反应速率,其原因可归结为从氧载体上迁移到煤颗粒上的 K_2CO_3 对煤- CO_2 气化步骤的催化作用(该步骤为整个还原过程的速率控制步骤);由于 K_2CO_3 本身的促熔效果及加入 K_2CO_3 后导致的剧烈氧化还原反应,可以发现, K_2CO_3 会增大铁基氧载体的烧结;不同惰性担体对铁基氧载体与煤的反应性影响不大,这是由于惰性担体对还原速控步没有影响; K_2CO_3 在多循环化学链燃烧过程中依然可以保持一定的催化活性,另外由于催化剂的流失与失活,使得氧载体的反应活性有所下降.

关键词: 催化 化学链燃烧 煤 氧载体 氧化铁 碳酸钾

Abstract: Effects of K_2CO_3 addition and inert supports on chemical looping combustion (CLC) of coal with iron-based oxygen carrier were investigated. The results indicate that the reduction of iron-based oxygen carrier by coal can be remarkably improved by the addition of K_2CO_3 . This enhancement can be ascribed to the catalytic CO_2 gasification (rate-controlling step) by K_2CO_3 which migrates from oxygen carrier to coal particles. The sintering of iron-based oxygen carrier is promoted by K_2CO_3 due to its low melting temperature and the intensified redox reaction after K_2CO_3 addition. The inert support has no significant effect on the reactivity between coal and oxygen carrier, which could be due to the inert support do not affect the rate-limiting step. The catalytic activity can be observed during several redox cycles. However, there is a decreasing tendency of activity due to the loss and deactivation of catalyst.

Key words: catalyst chemical looping combustion coal oxygen carrier iron oxide K_2CO_3

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