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# CO对褐煤快速热解行为的影响

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# Effect of CO on fast pyrolysis behaviors of lignite

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摘要 利用快速升温固定床进行了霍林河褐煤在CO气氛下快速热解反应行为的研究,考察了热解半焦的产率、性质和气体产物的分布特点。半焦的红外光谱图、元素含量和表面结构性质分析表明,CO参与并改变了褐煤的热解行为。与$N_2$气氛相比,热解温度低于600 ℃时,带孤对电子的极性CO容易诱发半焦结构中芳香环的开裂,侧链、醚键和脂肪链的断裂,促进小分子片段和自由基的生成,自由基稳定了煤热解生成的碎片,导致挥发分的生成和逸出量增加,$H_2$、$CH_4$、CO和$CO_2$的产率增大,半焦产率降低,半焦的比表面积和孔容增大。热解温度高于700 ℃时,CO的歧化反应程度增大,产生的积碳附着于半焦的表面,阻塞了孔道,导致半焦的比表面积和孔容减小,从而抑制了CO在半焦孔隙结构内部的扩散,限制了CO与煤中有机大分子结构的接触和反应,导致$H_2$、$CH_4$和CO产率减小,而$CO_2$产率因CO歧化反应而增大。

关键词: CO气氛 热解行为 半焦性质

Abstract: The fast pyrolysis of Huolinhe lignite under CO atmosphere was carried out in a fixed bed reactor. The distribution characteristics of gases, influence of CO on pyrolysis behaviors were investigated by comparative analyses of FT-IR spectra, element content and surface structure property of the char. The results show that the CO participates in the pyrolysis process and changes the pyrolysis behavior. Below 600 ℃, the polarity of CO, which brings out by the lone pair electrons existed in CO molecule, can help to crack the aromatic ring, side chain, ether linkages and aliphatic chain in the char, resulting in the increase in smaller molecular fragments and free radicals. These free radicals can stabilize the fragments produced during pyrolysis, which contributes to the generation of more volatile including $H_2$, $CH_4$, CO and $CO_2$, as well as less char with higher specific surface area and pore volume. Above 700 ℃, the carbon deposition produced by the increasing CO disproportionation reaction can partially cover the surface of the char and block its pore, leading to the decrease in surface area and pore volume of the char as well as inhibiting the diffusion of CO in the pore structure. This effect suppresses the contact and reaction between CO and organic macromolecules of coal, resulting in the decreases in the yield of $H_2$, $CH_4$ and CO as well as the increase in the yield of $CO_2$ due to CO disproportionation reaction.

Key words: CO atmosphere pyrolysis behaviors char property

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