

层流炉内颗粒停留时间PIV测量 PIV Measurement of Resident Time for Char Particle in Laminar Entrained Flow Reactor

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关键词: 层流炉 颗粒 停留时间 PIV测量

摘要: 为了确定生物质热分解产物在层流炉内的停留时间,设计了一套层流炉透明冷态模拟装置,以炭粉代替生物质热解固体产物,利用PIV技术测量炭粉在不同主气流量和收集距离下的停留时间。根据流场相似准则,即冷态流场与热态流场雷诺数相等,确定主气流量分别为1.0、1.5、2.0和2.5 m<sup>3</sup>/h;收集距离由热态实验确定,分别为200、250、300和350 mm。测量结果表明:对于同一收集距离,炭粉的实际停留时间与气流理论停留时间的比值与流场雷诺数呈正比。而收集距离不同,函数关系式不同。因此当管内气体流动满足层流状态时,根据已知热态层流炉内流场的雷诺数和气流理论停留时间,可以利用此函数关系计算出颗粒实际的停留时间。 A transparent simulating device was designed for investigating resident time of pyrolysis product of biomass in laminar entrained flow reactor. Resident time for char replacing pyrolysis product was measured using PIV (particle image velocimetry) at different gas flow rates and collection distances. Main gas flow rate, which measured at 1.0, 1.5, 2.0 and 2.5 m<sup>3</sup> /h respectively, was determined by the similarity criteria that Reynolds number should be equal both in cold and hot flow field. Collection distances were 200, 250, 300 and 350 mm. The results showed that the ratio of actual resident time of char and theoretical resident time of gas was proportional to Reynolds number, which meant the ratio of time and Reynolds number had one order functional relationship. Functional relation was different for different collection distances. It can therefore be concluded that when flow field is laminar, resident time of char can be calculated by functional relationship between ratio of time and Reynolds number.

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