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多相流和计算流体力学

流化床内石英砂的热破碎及其灰色预测模型

热破碎, 石英砂, 流化床, 灰色预测模型

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摘要

在热态流化床实验台上进行了流化床床料-石英砂的热破碎实验，实验中考虑了初始颗粒尺寸（2.5～6 mm）和床温(650～950℃)对破碎的影响。研究发现，随着床温的升高和颗粒初始尺寸的增大破碎指数S f明显增大。当床温低于650℃时，S f＜2，表明在此床温下颗粒基本不发生破碎现象。破碎后的粒度分析表明石英砂的破碎是在表面进行的，破碎的主要动力是温度梯度引起的在颗粒表面产生的压应力。基于灰色系统理论建立了关于预测床料破碎的灰色模型GM(1,3)，预测结果与实验数据对比表明该预测模型精度较高，预测平均误差为8.79%。应用灰色模型GM(1,3) 预测了一定床温下颗粒破碎的临界破碎直径。

关键词

热破碎 石英砂 流化床 灰色预测模型

分类号

Thermal fragmentation of quartzite particles in fluidized bed and gray forecasting model

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Abstract

he fragmentation experiments of quartzite particles were carried out in a bench-scale hot state fluidized bed rig.The influence factors, such as initial size of particles (2.5—6 mm) and bed temperature (650—950℃) on the fragmentation were investigated.The results showed that the fragmentation index S f increased with increasing bed temperature and particle initial size.The fragmentation was very limited when bed temperature was lower than 650℃.The particles size distribution analysis showed that it was compressive thermally-induced stresses within the outer region of particles that caused the particle to fracture with many small fragments.A gray forecasting model GM (1, 3) was developed to predict the thermal fragmentation of the quartzite particles based on the gray theory.The average prediction residual error is lower than 8.79%.The critical fragment diameter was forecasted by using the model GM (1, 3).

Key words

thermal fragmentation quartzite particles fluidized bed gray forecasting model

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