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发电

梯度磁场中燃煤PM10聚并动力学数值模拟

李永旺[1];赵长遂[1];吴新[1];鲁端峰[1];韩松[1]

东南大学洁净煤发电及燃烧技术教育部重点实验室[1]

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摘要

提出了求解梯度磁场中燃煤PM10聚并动力学方程的三分区算法，应用该算法模拟了0.023~9.314μm粒径范围内大同煤灰在永磁环梯度磁场中的聚并动力学过程，并与实验结果进行了比较。结果表明：数值模拟结果与实验结果相一致，三分区算法具有较好的适用性；中间粒径粒子的聚并脱除效率高于小粒子和大粒子的聚并脱除效率；增大粒子质量高，数目中位直径减小，单粒径聚并脱除效率最大值对应的浓度、延长粒子在磁场中聚并时间，粒子的聚并脱除效率提粒径减小；增大平均气流速度，粒子的聚并脱除效率降低，数目中位直径增大，单粒径聚并脱除效率最大值对应的粒径增大。

关键词 燃煤PM10 磁聚并 梯度磁场 永磁环

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Numerical Simulation on Aggregation Dynamics of Coal-fired PM10 in Gradient Magnetic Field

Abstract

A triple sectional algorithm was developed for solving the general dynamic equation of coal-fired PM10 in a gradient magnetic field, and then it was used to simulate the aggregation dynamic process in the gradient magnetic field formed by permanent magnetic rings for the fly ash particles in the size range of 0.023-9.314μm from Datong coal combustion. The comparison was done between the simulation and experimental data. The results show that the two sets of results are essentially consentient, which indicats that the triplele sectional algorithm can be readily used. The particle removal efficiencies for the mid-sized particles are higher than those for the smaller and bigger ones. With increasing of the particle mass concentration and the particle aggregation time in magnetic field, the particle removal efficiency increases, and the particle number median diameter and the particle size corresponding to the highest single-sized removal efficiency decrease. When the average gas velocity increased, the particle removal efficiency decreases and the particle number median diameter increases.

Key words PM10 from coal combustion magnetic aggregation gradient magnetic field permanent magnet ring

DOI:

通讯作者 李永旺 ywli666@163.com

作者个人主页 李永旺 赵长遂 吴新 鲁端峰 韩松