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## 喷雾造粒制备SiC-AlN复合粉体特性及烧结性能

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**摘要:** 采用水基料浆与流态化喷雾造粒相结合制备SiC-AlN复合粉体, 分析复合粉体的粉体特性、成形性能及烧结特性, 探讨SiC-AlN复相陶瓷的增强增韧机制。结果表明: 喷雾造粒后, 复合粉体的流动特性显著提高, 粒度级配合理; 随着压强增加, 坯体密度在40-80、80-160和160-220 MPa范围内呈现阶梯式增长, 160 MPa以上成形后素坯均匀致密, 无硬球颗粒存在; 无压烧结SiC-AlN复相陶瓷具有优越的烧结性能和力学性能, 这是由于AlN对SiC晶粒形成生长势垒, 并反应生成2H型固溶体, 从而细化晶粒, 导致裂纹扩展产生了绕道与偏转效应, 呈现晶粒撕裂与拔出现象, 协同改善了复相陶瓷的强度及断裂韧性。

**关键字:** 碳化硅; 氮化铝; 喷雾造粒; 复相陶瓷; 粉体; 烧结

## Characteristics and sintering behaviors of SiC-AlN composite powders obtained by spray drying

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**Abstract:** The SiC-AlN ceramic powders were prepared by combining aqueous slurry with fluidized spray drying, and the powder characteristics, sintering behaviors and strengthening mechanism of SiC-AlN multiphase ceramic were investigated. The results shows that the flow characteristics of SiC-AlN granulated powder is obviously promoted after spray drying and a suitable particles grade match. With the increasing of pressure, the density of green body increases by the style of ladder at the pressure range of 40-80 MPa, 80-160 MPa and 160-220 MPa, the green body is uniform and densification without hard pelleted particles above 160 MPa. The pressureless sintering SiC-AlN multiphase ceramic possesses superior sintering properties and mechanical properties. It is due to the rampart formation of AlN to SiC grain growth and the reaction of SiC and AlN to form 2H solid solution. It results in the grain fining, crack expansion producing bypass and deflection, fracture section producing tearing-open and pulling-out effects, which cooperatively improves the strength and fracture toughness of

the multiphase ceramics.

**Key words:** silicon carbide; aluminum nitride; spray drying; multiphase ceramic; powder; sintering

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