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Direct selective laser sintering and properties of SiC ceramics doped with Al2O3-Y2O3

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Direct Selective Laser Sintering (DSLS) of SiC ceramics offers a rapid and efficient approach for fabricating complex shaped porous SiC structures, positioning it as a promising additive manufacturing technique for such materials. However, the inherent difficulty of maintaining a stable liquid phase in SiC introduces challenges during laser based solid state sintering, such as slow diffusion kinetics and insufficient interparticle bonding, leading to poor mechanical integrity in the sintered ceramics. This study explores the influence of Al2O3-Y2O3 liquid phase sintering additives on the porosity, microstructure, and physical properties of SiC ceramics sintered under varying energy densities. The results demonstrate that by modulating the energy density during DSLS from 5.5 J/mm2 to 13.9 J/mm2, porous SiC ceramics can be obtained with porosities ranging from 45.57% to 56.91%. As energy density increases within this range, the compressive strength increases from 25.00 MPa to 181.80 MPa, thermal conductivity from 6.12 W·m-1·K-1 to 15.66 W·m-1·K-1, electrical resistivity from 4.17 Ω·cm to 34.58 Ω·cm, and specific compressive strength from 17 MPa·cm3·g-1 to 97 MPa·cm3·g-1. This work elucidates the microstructural evolution and correlated variations in the physical properties of DSLS fabricated SiC ceramics facilitated by Al2O3-Y2O3 liquid phase sintering aids.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

Yes

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