Direct Ink Writing of Nanosized Ceramics and Graphene Oxide Materials

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Abstract

3D printing methods allow the development of complex computer-designed geometries by sequential addition of material. Filament or extrusion printing is one of the direct ink writing (DIW) methods for creating structured designs of considerable complexity [1]. Most part of the success in building stable structures depends on an appropriate ink formulation that should have viscoelastic characteristics. Some examples on the 3D printing of SiC with nano-sized powders, as well as graphene-oxide (GO) nanostructures will be presented. 3D SiC(Fe) structures have shown applicability in catalytic processes for wastewater treatments [2]. Due to its hydrophilic character, GO is the preferably graphene related material for the ink formulation and examples of the structures created are shown. 3D GO structures can also be used as a platform for making hybrid composites, for example by Cu electrodepositing or infiltrating with a polymeric ceramic precursor. For the later, structured GO /ceramic composites are achieved after heat treatment steps. These composite structures show interesting properties for heat dissipation devices and energy storage [3].

References

[1] J. A. Lewis, Adv. Funct. Mater., 83 (2006) 2193-2204
[2] A. Quintanilla et al., Appl. Cat. B: Environmental, 235 (2018) 246-255
[3] J.J: Moyano et al., addit. manf., 30 (2019) 100849

Figures

Figure 1: 3D printed structures of SiC

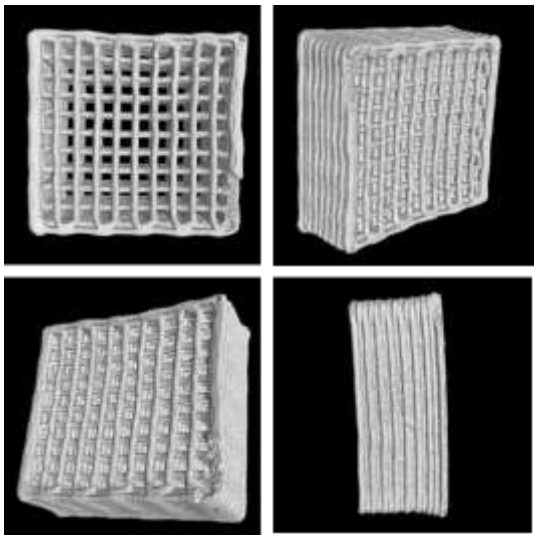

Figure 2: Computed tomography of 3D SiOC/reduced GO composite by DIW and polymer infiltration