

Materials List for:

Negative Additive Manufacturing of Complex Shaped Boron Carbides

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Materials

Name	Company	Catalog Number	Comments
Boron carbide powder 1250F	Tetrabor Ceramics	Lot 211M419	>96% purity
Boron carbide powder 1500F	Tetrabor Ceramics	Lot 209M102/9	>96% purity
Boron carbide powder 3000F	Tetrabor Ceramics	Lot 111m53/9	>96% purity
Polyethylene Imine (PEI)	Sigma Aldrich	MKBP3417V	Averaged MW ~25,000 by L.S.
Resorcinol	Sigma Aldrich	MKBG6751V	BioXtra, ≥99%
Formaldehyde	Fisher Scientific	F79-1	37% by weight; Stabilized with 10-15% Methanol
Acetic Acid	Sigma Aldrich	SKU 695092	Glacial ≥99.7%
Acetone	Sigma Aldrich	SKU 179124	ACS Reagent Grade ≥99.5%
Water	LLNL In-house (Milli-Q)		
Planetary Mixer	Thinky	AR-250	Fits 150mL and 300mL Thinky containers
Acrylonitrile butadiene styrene (ABS) plastic filament	eSUN		Natural color
Taz 6 (3D printer)	Lulzbot		FDM 3D printer
4%H ₂ /96%Ar gas	Air Gas	UHP	4% Hydrogen, balanced Argon
Helium gas	Air Gas	UHP	Helium
Heating oven	Neytech	Vulcan 9493308	Oven for 80 °C curing
Quartz tube furnace	Applied Test Systems, Inc.	LEA 05-000075	Furnace for 1050 °C carbonization
Graphite furnace	Thermal Technology LLC		Sintering furnace
Scanning Electron Microscope (SEM)	Jeol	JSM-7401F	
pH meter	Thermo Scientific	Orion 4 Star	calibrated with buffer standards
Rheometer	TA Instrument	AR2000ex	For measurement of viscosity
X-ray Diffractometer (XRD)	Bruker	AX D8 Advanced	
Analytical balance	Mettler Toledo	XS104	
Bruker EVA			XRD Analysis Software