



120 Valley Court  
Oak Ridge, TN 37830  
Ph: 865-482-5717  
FAX: 865-482-1281  
zypcoatings.com

## 3D Cer-Paste ZRP

### 3D Printable Thermal Shock Resistant Ceramic

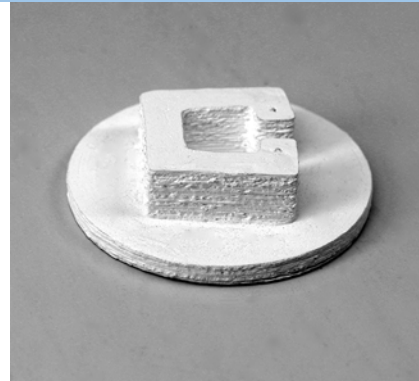
Based on nearly 40 years of experience formulating exceptional high temperature ceramic coatings, ZYP Coatings is proud to present its first line of ready-to-use ceramic pastes formulated for 3D printing. Prior to a commercial launch, the pastes were tested and implemented for 3D printing projects within the Materials Science and Technology Division at Oak Ridge National Laboratory. The solvent-based pastes can be used in extrusion-based Paste Deposition Modeling (PDM) 3D printers, similar to desktop Fused Deposition Modeling (FDM) printers used for polymers, except no heat is required. Once dry, parts printed with 3D Cer-Paste ZRP can be sintered in air up to temperatures of 1500 C without warping or cracking. The resulting ceramic possesses low density, high resistance to corrosion and excellent thermal shock resistance. End uses that require insulation for fast heating and cooling would be ideal for ceramic parts printed with 3D Cer-Paste ZRP.

#### Key Attributes

- Solvent-based formula is easily printed with common, inexpensive 3D printer assemblies
- No heat required
- Once dry, printed ceramic pieces can be fired in air up to 1500 C
- Does not crack or warp during sintering
- Low density ceramic: 2.75 g/cm<sup>3</sup>
- Corrosion resistant

#### Use Notes

1. Resuspend the paste by stirring, rolling or drill mixing.
2. If desired, the paste can be diluted with ethanol or polyethylene glycol to desired consistency.
3. Print ceramic article using normal extrusion operations on a PDM 3D printer.
4. Once dry, fire the ceramic article in air up to 1500 C. Suggested sintering: 10 C/min to 1400 C, hold for 2 hours, furnace cool. Shrinkage will be approximately 50-65% by volume.
5. Place the fired ceramic into service. Service temperature should not exceed the sintering temperature used in Step 4.



Printed ZRP part made by sintering two 3-D printed parts at 1400 C for two hours in air and then gluing them together and bonding/firing in air to 950 C for 30 minutes. Fired ZRP parts have excellent thermal shock resistance.

#### Specifications

Active Ingredients:	Proprietary refractory materials
Fired composition:	Proprietary mixed oxides
Liquid carrier:	Ethanol
Color:	White
Max Use Temperature:	1500 C
Use Atmosphere:	All
Shelf life:	>3 months
H F R Ratings:	1-4-0

Note that several 3D Cer-Paste ZRP ceramic pieces can be printed, fired and then glued together using ZYP's Vitraguard FS. Simply apply Vitraguard FS to the surfaces to be bonded, press the pieces together, allow the bond to dry, and fire in air to 950 C for 30 minutes.

#### Ideal Use

- Aerospace or aeronautical applications
- Thermal shock-resistant insulation
- High temperature corrosion-resistant fixtures

#### Sizes

Standard Size: gallon, quart, or pint Nalgene containers

#### Safety Information

- Consult SDS before use.
- Avoid breathing of dusts.
- For Industrial use only.

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