

Supercritical Fluid Application Notes

**SCF
506**

Extraction of Binders from Ceramics and Powder Injection Moldings Using Supercritical Fluids

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Introduction

The removal of binders (organic additives) from ceramics and powder injection moldings is normally accomplished by pyrolysis or the use of organic solvents.

These processes generate defects and residues of pyrolysis, which adversely affect the properties of the sintered materials. The use of non-hazardous supercritical CO₂ in the debinding process eliminates the use of toxic solvents and reduces the time needed to extract organic additives.



Equipment

- ✓ Applied Separations' *Spe-ed*™ SFE Supercritical Extraction System
- ✓ 500mL Extraction Vessel

Materials

- ✓ Injection Molded Bars
(Aluminum powder and paraffin)

Method

Place material to be extracted into an extraction vessel of appropriate size (1mL – 50mL) and extract at specified conditions.

Extraction Conditions

| | |
|----------------------------|-------------|
| Pressure: | 5000 psi |
| Temperature: | 50°C - 70°C |
| CO ₂ Flow Rate: | 20L/min |
| Extraction Time: | 3 hours |

Results

Material: Injection molded bars
(alumina powder and paraffin)

Binder Removal Time

| | |
|------------|----------|
| SFE: | 3 hours |
| Pyrolysis: | 18 hours |

Conclusion

Organic binders can be removed from ceramic parts with low temperature supercritical carbon dioxide. The supercritical extraction process produced parts that were not deformed, did not contain pyrolytic residues, and was much faster than the traditional pyrolytic process.