EEMS continues to develop our "CSO" family of Carbosiloxane Polymers that can be employed for a wide range of applications. Among the uses for the CSO Polymers are:

- Low viscosity liquid precursors for infiltration of preforms followed by pyrolysis to produce ceramic matrix composites
- Low temperature curing liquid, high ceramic yield binders for molding of ceramic and metal powder shapes to produce high temperature "plastic-like" components or ceramic/cermets parts after pyrolysis
- Melt processable powdered resins that can be used in pre-pregging, melt-blending and molding with powder or short fiber fillers
- Medium viscosity polymers that can be "B-Staged" to produce pre-preg fabrics that can later be pressed into parts
- Medium viscosity polymers that can be blended with chopped fibers and/or powder fillers and "B-Staged" to form molding compounds for injection molding or compression molding.

All of the EEMS, CSO polymers described below exhibit at least 6 months shelf life at room temperature in a closed container. Longer shelf lives can be obtained by storing in a chemical refrigerator or freezer.

EEMS provides three types of initiators/catalysts for the CSO polymers: platinum based, peroxide based, and organometallic based. Contact EEMS-LLC for recommendations based on your intended applications.

The following are short descriptions of some of the CSO polymers available from EEMS-LLC

CSO-110 HT is a low viscosity (10-40 cps), low surface tension liquid that can be cured as low as 65°C in minutes, or can be made to gel in 24 hours at room temperature with proper catalyst selection. It has been used to densify carbon and ceramic fiber preforms and as an infiltrating resin to produce ceramic matrix composites. The polymer has a 82-84% ceramic yield after 850°C pyrolysis. CSO-110 HT can also be blended with ceramic and metal powders to form slurries for coatings and molding compounds for injection and compression molding. It has been demonstrated to bond well with metallic and carbon materials after 900°C processing.

Recommended Catalyst: CLC-PL-005, CLC-PX004

CSO-111 HT is essentially CSO-110 HT with proprietary stabilizers to improve pot life when catalyzed with platinum catalysts. CSO-111 HT has a catalyzed pot life of over 1 month and will not cure with the recommended platinum catalyst concentrations even after 100 hours at 65°C. However, the polymer will cure at 105-120°C in minutes.

Recommended Catalyst: CLC-PL-005, CLC-PX-004

CSO-350 HT is a low viscosity liquid that can be processed like CSO-110 HT but has a broader curing range (65-110°C) and higher "as-cured" toughness. It can be used to produce composite parts for service at 200-250°C and used as a high yield ceramic precursor like CSO-110 HT. We expect (but have not proven yet) that the CSO-350 will also bond to metals, carbon, and ceramics and exhibit comparable properties.

Recommended Catalyst: CLC-PL-005, CLC-PL001, CLC-PX-004

CSO-351 HT is a stabilized version of CSO-350 HT with a longer platinum catalyzed pot life.

Recommended Catalyst: CLC-PL-005, CLC-PX-004

The CSO-300, 310 and 320 are higher viscosity (200-2000 cps) resins that can be "B-staged" to form melt-formable resins. These could be blended with powders while still liquid, the slurry/molding compound could then simply be injected into a mold, or poured into a mold and cured at below 200°C. Alternatively the powder slurry can be B-Staged to form a solid body that could be subsequently heated and compression molded, cut into pellets and warm injection molded, or warm molded by other methods. When processed with the proper heat treatment and catalyst, these resins have potential uses as gasket and seal materials for use in the 250 – 300°C range.

Recommended Catalyst: CLC-PL001, CLC-PX-008, CLC-PB081 - Depends on application – Please Contact EEMS

The CSO-300 series resins are intended for use in applications at 330°C and below.

However, These resins form slightly carbon rich ceramics that could be used to provide free carbon to react with metals such as Ti, Zr, Si, or **W** to form the appropriate carbides.

The material has sufficient oxidation stability (> 85% mass retention) when pyrolyzed that it could be used as a pre-pregging resin for layup of fabric that would be pressed to form components and then densified using CSO-110 HT

The pyrolyzed ceramic could also be processed in air to oxidize out the carbon nano-structures to create porous materials.

CSO-390 is a solid powder can be melt blended (melt at below 100°C) with ceramic and/or metal powders and melt injected/molded into a part that will have good green strength upon cooling, and will cure/pyrolyze into a ceramic bonded part. CSO-390 can also be melted and applied to fabric to form a pre-preg.

CSO-390 can also be dissolved in ethanol, toluene, acetone, etc and applied to fabric to form a non-tacky pre-preg after the solvent has been removed. The solvated polymer can also be used to coat ceramic or metal powders and spray dried.