# Organosilicon-based electrolytes to enable high energy lithium ion batteries

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Silatronix has developed a series of new organosilicon materials over years of improvements to molecular design and targeted electrochemically functional characteristics. Design of unique organosilicon molecules includes selection of specific ion coordinating functional groups, degree of fluorination, and optimization of geometric structure to balance molecular polarity, ionic conductivity, and viscosity. The inclusion of Si in the molecule has proved to be essential for maintaining improved thermal and electrochemical stability. Geometric design of the molecule directly affects solvation sphere coordination in electrolyte solution, and activation energy for solvation/de-solvation and intercalation into electrode structures. Fortunately, several OS solvent materials have demonstrated excellent performance in Lithium Ion Battery (LIB) systems.

Currently Silatronix has commercialized production of an advanced OS solvent "OS3" that provides exceptional thermal, and high voltage electrochemical stability in LIB systems up to 4.5V in current commercially available electrode materials; and fundamental oxidation stability up to 7V in a platinum cell. OS3 also has low viscosity, good ionic conductivity, a high flash point >80˚C, and low freezing point <-55˚C. The most comprehensive performance benefits have been observed at <5% OS3 composition, which is fortunate for commercialization of OS3, as fits comfortably within the additive market space of the LIB industry.

OS3 is a strong coordinator of Li salts in electrolyte solution and has proven to prevent both decomposition of $LiPF_6$ and catalytic production of HF in particular; which is critical to enablement of the high energy LIB systems with long calendar life and excellent high temperature performance. This mechanism protects many components in LIB cell systems and long-term impedance growth is systematically reduced. Additionally, DSC thermal response of charged cathode materials with OS electrolytes have shown reduced peak heating rate and delayed exotherm onset temperatures.

**References:**

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