

For couple years, SPECIFIC POLYMERS contributes to the development of tomorrow's lithium batteries by the production of a large range of lithium salts, conductive polymers, additives and plasticizers.

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Extension of our Laboratories

Specific Polymers expands its **facilities & its team!**

This year, the increase in workforce will be accompanied by an increase of the working area. Both synthesis and analysis laboratories will be expanded, and a **new Formulation & Materials laboratory** will be created. Indeed, SP is willing to go further in the **development of innovative materials** to support its customers in more and more challenging applications. For this new activity, SP will focus its research on **thermoset resins, hybrid materials and composites**. For instance, projects dedicated to the development of **biobased epoxy resins, polyurethanes paints or high-performance materials** will be launched or maintained this year.

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A photograph of several cylindrical lithium batteries, with one orange battery in the foreground being more prominent than the others in the background.

Towards a high conductive and safer lithium battery electrolyte

Large range of innovative conductive polymers, salts, additives and plasticizers

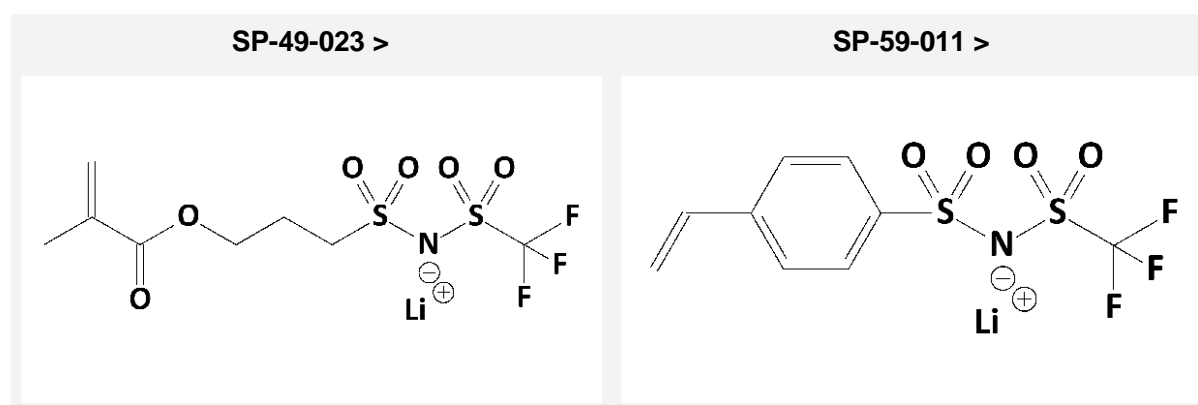
For decades, lithium battery (LiB) has been growing at a very fast pace owing to its considerable advantages, notably in terms of **energy density**. However, with the development of high energy consuming devices, more and more **powerful and fast charging Li-ion batteries** are required. Thus, limitation of energy density and safety issues observed lead to perform suitable technology as Li-Metal batteries. Compared to Li-ion technology, this battery uses **lithium metal** as anode material requiring a **gel polymer electrolyte (GPE)** or a **solid polymer electrolyte (SPE)** to limit or suppress dendritic growth.

Chemistry, performance, cost and safety characteristics vary across LIB types. Within this scope, SPECIFIC POLYMERS contributes, for couple years, to the **development of tomorrow's lithium batteries** by the production of a large range of **lithium salts, conductive polymers, additives and plasticizers**.

Lithium salts derivatives

For few months, SPECIFIC POLYMERS commercializes **LiTFSI derivatives**, LiMTFSI (**SP-49-023**) and LiSTFSI (**SP-59-011**), as promising single lithium-ion conductive polymer electrolyte. Indeed, TFSI moiety is considered as the best candidate[1] for **Li salt in lithium batteries** and LiTFSI is highly soluble in the usual solvents. Studies on their polymerization and development of new salts are underway.

[1] Mauger, A., Armand, M. et al., *Materials Science and Engineering: R: Reports*, 2018, 134, 1–21
Newsletter: Solid Polymer Electrolytes - Monomers for Li-ion Batteries

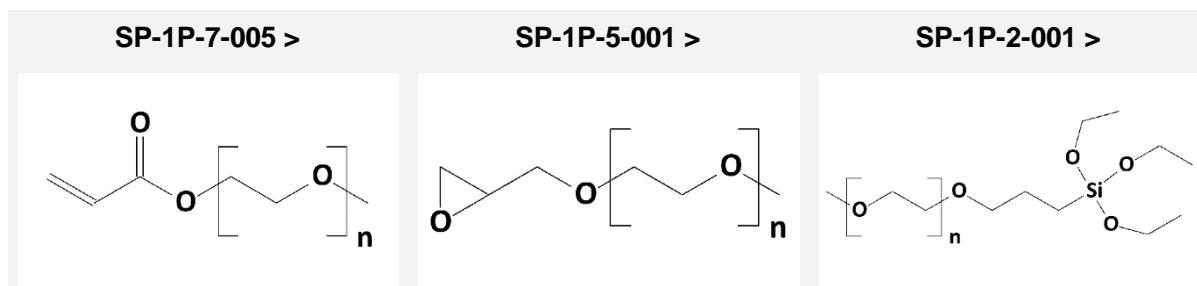


Conductive polymers

Within GPE or SPE, lithium conductivity is predominantly ensured by **polyethylene glycol (PEO)**, **polypropylene glycol (PPO)** or **polyesters**. Polymers composition and architecture can be tuned to promote SPE self-organization and thus **improve lithium conductivity, limit transference or avoid dendrites**[2]. SPECIFIC POLYMERS possesses a rich brochure of functionals PEO and PEO/PPO with various molecular weight or PEO/PPO ratio. Moreover, thanks to SPECIFIC POLYMERS expertise, on-demand polymer synthesis can be performed

by **conventional or controlled radical polymerization** (RAFT or ATRP). Plus, our macromonomers can found interest either in **radical or cationic UV-polymerization or sol-gel chemistry**.

[2] Heng Zhang, M. Armand et al., Chem. Soc. Rev., 2017, 46, 797



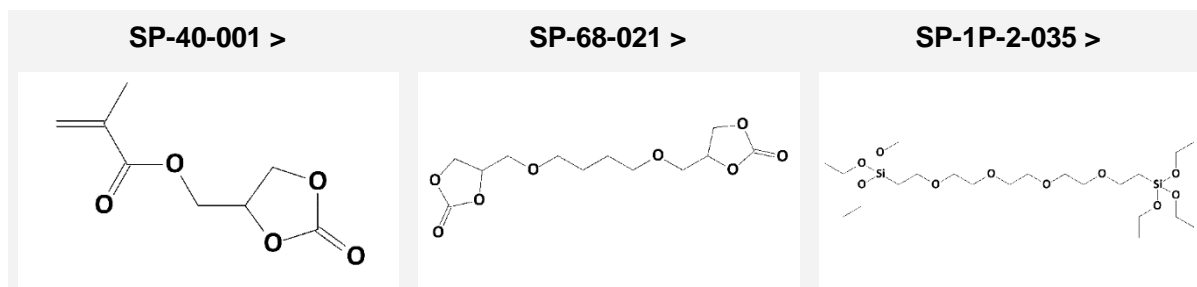
Additives and plasticizers

Additives and plasticizers are widely used to enhance the performance and the safety of GPE and SPE[3]. To avoid safety issues due to leak or flammability risks, **SPECIFIC POLYMERS** develops **low vapor pressure compounds** as cyclic carbonate or organosilicon. Low viscosity, high mobility, large electrochemical stability window and high dielectric constant enable **electrolyte performances improvement**.

[3] Atetegeb Meazah Haregewoin et al., Energy Environ. Sci., 2016, 9, 1955

Newsletter: Cyclocarbonates - Towards Sustainable Thermoset Materials

Newsletter: Si-Polymers - Let's adapt our chemistry to yours!

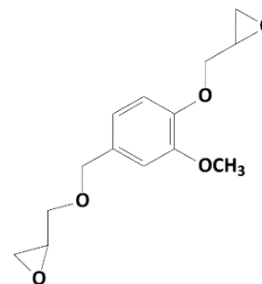


[Learn more about Functional Conductive Polymers >](#)

Product of the Month

DiGlycidylEther of Vanillyl Alcohol (DGEVA) – SP-9S-5-005 >

Epoxy polymers are one of the most used classes of thermosets in many applications (coatings, adhesives, composites etc.) for their **excellent adhesion properties, chemical and heat resistance, and good mechanical properties** among others. Great attention was paid to renewable resources-derived epoxy thermosetting materials[4], especially because



they are crosslinked polymers and thus cannot be recycled. Thus, with the highlighting of various controversial substances[5] like Bisphenol A for instance, access of **novel bio-based and non-harmful aromatic epoxy building-blocks** is one of the main challenges of the years to come. In this way, **SPECIFIC POLYMERS** proposes the Diglycidyl Ether of Vanillyl Alcohol (SP-9S-5-005) with a production scale up to 200g. Its aromatic moiety is able to maintain **high mechanical and thermal properties** to the network as observed with epoxidized Bisphenol A[6]. Finally, combined with Phloroglucinol Tris Epoxy (PHTE) (SP-9S-5-003) or others bio-based epoxy compounds, a large range of **glass transition temperature and mechanical properties** can be reached.

[4] J. M. Raquez, P. Krawczak et al., Prog. Polym. Sci., **2010**, 35, 487–509

[5] C. O. Tuck, M. Poliakoff et al., Science, **2012**, 337, 695–699

[6] M. Fache, B. Boutevin et al., Green Chem., **2016**, 18, 712

Learn more about Biobased & Non-toxic Materials >

News & Events

SP commitment in the Polymer Community

As a result of its commitment, **SPECIFIC POLYMERS** sponsors the upcoming workshop « **Polymers for fuel cells, energy storage, and conversion** » which takes place in Pacific Grove (USA). The objective of this congress is to engage a **broad spectrum of the polymer community** in meeting the needs of this technology. SP is dedicated to promoting and remaining informed of the new developments in the fields of polymers.

Learn more about Pacific Grove Congress >

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- › Report on the project progress by **regular phone meeting**
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