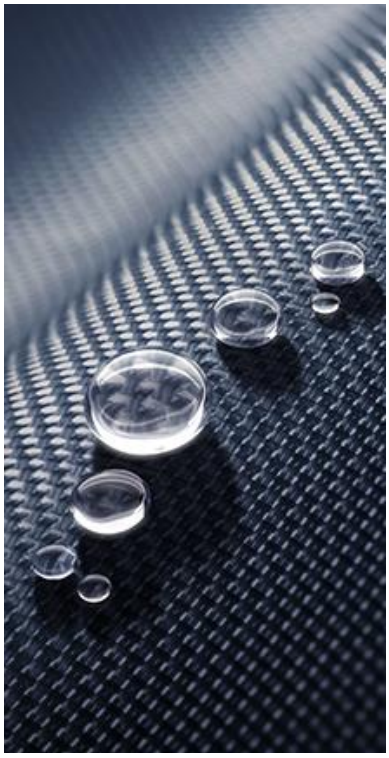
Materials chemistry corresponds to the studies dedicated to the design of materials with novel properties such as optical, electrical, magnetic, catalytic, thermal, or mechanical properties. This science relies on the paradigm of **the understanding of the influence of the chemical structure on the processing and the resulting properties**. A large range of materials are available and can be classified in three different groups: ceramic, metals and polymers.

In SPECIFIC POLYMERS, innovative polymeric materials are prepared every day to achieve our customer's goals. Our strong expertise, based on our knowledge of the organic and polymeric chemistry, enables us to **design suitable formulations that will lead to the desired properties**. To diversify our fields of applications and reach new performances, we extend our studies to hybrid materials that combine organic and inorganic components at molecular scale. The synergy created by this association leads to remarkable properties and, for this reason, these materials are at the edge of most recent technical innovations.

SPECIFIC POLYMERS has been working on a large range of polymeric matrices that are either thermosets or thermoplastics. The thermosets present the advantages to be **thermally stable, chemically resistant and show superior strength** while thermoplastics are **recyclable and present high impact resistance**. These last years, our work has been mostly dedicated to the development of new thermoset materials and coatings as the versatility of the monomers (chemical nature, functionality, composition of the formulation…) enables a fine tuning of the final properties. Epoxy resins, polyurethanes, polyacrylates, phenolic resins and polyesters are widely employed in industrial applications and thus have been at the center of our studies. In parallel, thermoplastics

have been used mostly as additives into our formulations to provide for instance high service temperatures and toughness. Moreover, SPECIFIC POLYMERS is willing to contribute to the environmental change and thus, focused more and more its research effort on **(i) the development of water-based formulations, (ii) the substitution of fossil resources with bio-based precursors and, (iii) the photo-polymerization which is considered as a "green process"**. For instance, water-based conductive paints are currently elaborated in our labs and could replace solventborne formulations as they attain the same level of conductivity.

To incorporate new properties to our materials, a large class of polymers are considered and formulated in SPECIFIC POLYMERS. To cite just a few examples, we are used to work with:



- Fluoropolymers for lubrication and weatherability
- Rubbers for impact resistance and elasticity
- Polycaprolactone for flexibility and hydrophobicity while providing biocompatibility
- Polylactic acid or polylactid acid-co-glycolide for biodegradability
- Cationic polymers for antimicrobial activity
- Polyethers for hydrophilicity
- Polyacrylamide or polydiacetylene for stimuli responsive behavior with pH or light
- Fluorinated and NLO polymers for low or high refractive index
- Silicones for hydrophobicity and toughness
- PEAK, Polyimide, Polyetherimide and Polyethersulfone for thermal stability

Depending on the specifications, our formulations of polymers are also implemented with inorganic particles such as graphene, silver or carbon nanotubes or modify to be processed as sol-gel formulations. The field of possibilities is thus broadened as these counterparts can bring **electrical or thermal conductivity, modify drastically the refractive index of the material, or enhance the resistance to abrasion**. At last, carbon or glass fibers can be impregnated with our formulations to create **high performing composites**. Vegetable fibers combined with bio-based resins or UV-curable formulations are also studied for the elaboration of **"green composites".**

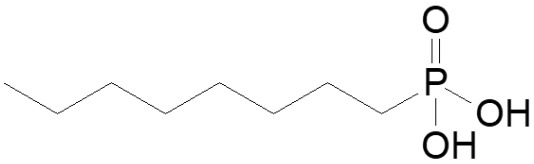
Learn more on our related products >

Product of the month

Alkyl Phosphonic Acid C8 | SP-31-003 >

SP-31-003 is a phosphorus-based ligand bearing a C8-alkyl chain of high interest in **optoelectronic and photoluminescence applications**. The phosphonic acid function allows to form inter-ligand hydrogen bonds conferring auto-assembly properties to systems on metallic surfaces.

SP-31-003



Indeed, SP-31-003 is used to design self-assembled monomayers (SAMs) on aluminium surfaces [1] as well as on perovkite lattice [2]. As an exemple, this C8 alkyl phosphonic acid is described to strongly bind through hydrogen bounds to inorganic CsPbX3 nanocrystals allowing to **prevent the formation of surface trap and increase the performance of Light-Emitting Diodes** (LEDs). [3] Analogs with longer alkyl chains (C12 / C14 / C18) are also available in our products portfolio, do not hesitate to contact us for any further information.

[1] N. Hiwasa and al., **Stability of a phosphonic acid monolayer on aluminum in liquid environments**, Japanese Journal of Applied Physics, 59, SDDA08, (**2019**) >

[2] F. McGrath and al., **Synthesis and dimensional control of CsPbBr3 perovskite nanocrystals using phosphorous based ligands,** The Journal of Chemical Physics, 152 (17), 174702, (**2020**) >

[3] a/ A. A. M. Brown and al., **Self-assembly of a robust hydrogen-bonded octylphosphonate network on cesium lead bromide perovskite nanocrystals for light-emitting diodes**, Nanoscale, 11 (25), 12370-12380, (**2019**) >

[3] b/ B. Zhang and al., **Alkyl Phosphonic Acids Deliver CsPbBr3 Nanocrystals with High Photoluminescence Quantum Yield and Truncated Octahedron Shape,** Chemistry of Materials, 31 (21), 9140-9147, (**2019**) >

[3] c/ Y. Tan and al., **Highly Luminescent and Stable Perovskite Nanocrystals with Octylphosphonic Acid as a Ligand for Efficient Light-Emitting Diodes**, ACS Applied Materials & Interfaces, 10 (4), 3784-3792, (**2018**) >

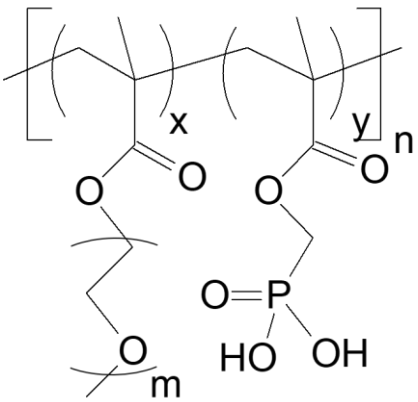
Access the SP-31-003 >

Publication of the month

Polymer coated cerium oxide nanoparticles as oxidoreductase-like catalysts >

Authors: V. Baldim, Y. Nisha, N. Bia, A. Graillot, C. Loubat, S. Singh, A. S. Karakoti, J.-F. Berret (2020)

SP-4P-1-011



This scientific article is highlighting interest of some of SPECIFIC POLYMERS' polymers in the field of **nanomedicine**. Indeed, in this work, the influence of Cerium oxide nanoparticles polymer coatings on their enzyme-like catalytic activity has been studied. It was demonstrated that **the particles coated with the PEG-grafted copolymers (PEOMA-co-MAPC1 Acid) perform better than conventional poly(acrylic acid)-coated ones as oxidoreductase-like enzymes**. This result confirms the benefit of having phosphonic acids as anchoring groups at the particle surface.

Corresponding **PEOMA-co-MAPC1 Acid >** (SP-4P-1-011) was provided by SPECIFIC POLYMERS to carry out this study.

Access the publication >

Collaborative Project

ECOXY >

ECOXY project is fully in line with our research area dedicated to materials and environment. Indeed, our objective within this project was to develop biobased counterparts to petro-based epoxy resins currently used in some specific applications fields. Our goal was to develop a toolbox of biobased epoxy resins that can bring soft to tough thermomechanical properties.

To learn more on the project, access the video that we have realised and discover our main results within the ECOXY project.

This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 744311.

Access the VIDEO >

Learn more on ECOXY >

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