Editorial corner – a personal view

Inorganic/organic hybrids, ceramic precursor polymers, composites: specialty materials of the future?

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Inorganic and organic solids have significant, but mostly mutually exclusive advantages over each other, therefore one usually selects inorganic or organic solid for certain applications depending on the requirements. Traditional mineral filled polymers meant the simplest combination of organic polymers with inorganic materials, followed later by organic-inorganic hybrids, ceramic precursor polymers and other organic/inorganic nanostructures. Even the classical filler technology was tuned up e.g. by using low melting point metal alloys (DOI: [10.1081/PPT-100101407](https://doi.org/10.1081/PPT-100101407)) or phosphate glasses (DOI: [10.1002/pc.10070](https://doi.org/10.1002/pc.10070)) which behave as liquids (melts) during the melt processing of polymers. This results not only in completely new morphologies, but in new behavior. Micro-phase separation of inorganic moieties appears not only in ionomers, but also in sol-gel derived polymeric composites. Sol-gel derived structures can also be fired to remove all organic components, resulting in glassy, crystalline or nano-structured bulk, coating or fibrous structures. Nano-wire and nano-fiber formation by electrospinning of inorganic filled or ceramic precursor polymers became very fashionable and successful research direction, among others in the development of energy-harvesting. Ceramic precursor polymers are becoming more and more sophisticated and the up-to-date structural investigation methods allow a more precise understanding of their decomposition and transformation process. The extensive use of electrochemical technologies to develop new conducting polymer/inorganic, conducting polymers/

nanotube and/or graphene and/or nanoplatelet structures allow the development of new, ordered nanostructures with special properties. Not only periodical superlattices (DOI: [10.1186/1556-276X-7-71](https://doi.org/10.1186/1556-276X-7-71)), but also quantum dot nanocomposites can be developed using conducting polymers (DOI: [10.1021/bk-2010-1034.ch010](https://doi.org/10.1021/bk-2010-1034.ch010)). Organic-inorganic copolymers are used as precursors (DOI: [10.1002/adfm.200400462](https://doi.org/10.1002/adfm.200400462)) or as electrolytes (DOI: [10.1021/ma301404q](https://doi.org/10.1021/ma301404q)). Nanostructured, metal containing polymer precursors are used for high temperature, non-oxide ceramic synthesis (DOI: [10.1016/S0955-2219\(02\)00119-X](https://doi.org/10.1016/S0955-2219(02)00119-X)). Biopolymer based hybrids (see e.g. DOI: [10.1039/B505640N](https://doi.org/10.1039/B505640N)) include not only immobilized enzymes but also polysaccharide based hybrids, including cyclodextrin moieties attached to inorganic particles or media, capable of selective adsorption. Even this cursory glance at the recent development of inorganic/organic hybrid technologies, including ceramic precursor systems shows that several new technical solutions can be expected from this lively research field.

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