Progress in research and applications of conducting polymers: topical issue

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Conducting polymers, represented especially by polyaniline and polypyrrole, are organic semiconductors that display electronic and as the case may be ionic conductivity. They compose a class of materials with properties extending beyond the physics of electricity. The recent trends in the research of conducting polymers are oriented into several directions, and some of them are demonstrated by the papers constituting this topical issue.

The first goal is the understanding of polymer synthesis (Falletta et al. 2021; Kurisu et al. 2021) aimed at the enhancement of conductivity (Alesary et al. 2021), improvement of stability (Smirnov et al. 2021) and the control of morphology at nanoscale (Li et al. 2021; Zaghlool et al. 2021). In addition to polyaniline and polypyrrole, conjugated polymers such as polythiophene derivatives (Ichikawa and Goto 2021) and poly(*p*-phenylene vinylene) (Banerjee and Dutta, 2021) have also become of interest. Conducting polymers serve also as substrates for the preparation of derived materials, such as nitrogen-containing carbons (Milakin et al. 2021).

Conducting polymers are usually obtained in intractable form of insoluble powders. In order to meet the materials properties required by applications, the conducting polymers are deposited on substrates providing the desired structure and mechanical parameters. The preparation of conducting sponges (Stejskal et al. 2021) or surface-modified inorganic oxides (Falletta et al. 2021; Cogal et al. 2021) serves as examples.

Conducting polymers are not just conducting, and many applications do not exploit the conductivity. These include their electrochemistry applied in sensors (Cogal et al. 2021) or battery electrodes (Kondratiev and Holze 2021), pollutant

adsorption in environmental issues (Mahmud et al. 2021; Stejskal et al. 2021; Zaghlool et al. 2021) or polarizability in electro-responsive suspensions (Dong et al. 2021). The list can be extended by electrocatalysis and photocatalysis, electromagnetic radiation shielding, antibacterial performance, stimuli responsivity, flame retardation, and other uses. Conducting polymers are thus exciting objects of present and future research.

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