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Self-assembled nanomaterials for flexible photo-electronic polymer devices

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Self-assembled nanostructures generated from synthetic polymer systems such as controlled polymer blends, semi-crystalline polymers and block copolymers have gained a great attention not only because of the variety of nanostructures they can evolve but also because of the controllability of these structures by external stimuli. In this presentation, various novel photo-electronic materials and devices are introduced based on the solution-processed nanomaterials such as networked carbon nanotubes (CNTs), reduced graphene oxides (rGOs) and 2 dimensional transition metal dichalcogenides (TMDs) with self assembled polymers including field effect transistor, electroluminescent device, non-volatile memory and photodetector. For instance, a nanocomposite of networked CNTs and a fluorescent polymer turned out an efficient field induced electroluminescent layer under alternating current (AC) as a potential candidate for next generation displays and lightings. Furthermore, scalable and simple strategies employed for fabricating rGO as well as TMD nanohybrid films allowed for high performance and mechanically flexible non-volatile polymer memories and broad band photo-detectors, respectively.

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The sorption material based on ferromanganese nodules for wastewater treatment

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For wastewater treatment of metallurgical plants contaminated with non-ferrous metals and organic substances, it is suggested the use of the sorbent based on ferrous-manganese nodules (FMN). FMN are oceanic mineral associations of hydroxides of iron and manganese. They characterized by high values of porosity and surface area. FMN is a natural cation by dissociating with elimination of H⁺ functional groups =Mn-OH on the surface of the manganese dioxide. Cation exchange feature allows you to use such material for the purification of process water from a variety of metals [1].

Water purification based on oxidative function of MnO₂. This material allows no special oxidants needed to convert Fe²⁺ to Fe³⁺, removed from the cations iron (II).

For the reaction: $2\text{Na}^+_{(s)} + \text{Me}^{2+}_{(aq)} = 2\text{Na}^+_{(aq)} + \text{Me}^{2+}_{(s)}$ the thermodynamic description of the exchange ions of various metals, and sodium on the surface of ferrous-manganese nodules, using the law of mass action, the modified ion exchange process. As the basic criterion of sorption abilities cations in the preparation of the lyotropic series was taken decrease the Gibbs energy of ion exchange are shown in table 1. The work is devoted to the study of the sorption capacity and catalytic activity of the FMN in the process of purification of the toxic compounds [2].

Reagentless methods are the most effective and environmentally friendly for wastewater treatment. Their use prevents the secondary pollution of water chemicals. Application of a sorbents with oxidizing function like FMN allows to continuously reduce toxicants from wastewater. FMN could be recommended for use as an oxidant phenol and cyanide in the neutral and weakly alkaline media. Based on the limit values of sorption constants and cations exchange function FMN could be recommended like universal sorbent.

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