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Temat pracy doktorskiej: „Właściwości powierzchniowe i fotokatalityczne cząstek TiO2 modyfikowanych cieczami jonowymi”

ABSTRACT

The activity of photocatalysts, both under the influence of UV and Vis radiation, depends strictly on their surface properties (such as: crystal structure, crystallite size, specific surface, porosity, absorption properties, presence and chemical character of dopants, etc.) and these depend on the preparation method. In recent years, ionic liquids (ILs) were also used for the preparation of metallic and semiconductor nanomaterials. According to the literature data, ionic liquids added to the reaction environment at the synthesis step may act as a structure-directing agent, a soft matrix or source of F^- anions generated *in-situ*, and may also enhance the photocatalytic activity of obtained materials. Up to date, most the research involving the ILs supported nano-/microparticles preparation were focused on metallic structures formation. Much less attention was devoted to semiconductors.

The aim of work was to explain and understand the influence of ionic liquids on the morphology, surface properties and photocatalytic activity of the obtained IL-TiO_2 microparticles. The research focused on obtaining new photocatalysts showing increased photocatalytic activity in presence of UV-Vis and visible irradiation. The PhD dissertation describes the results of three subsections for three series of samples: (i) TiO_2 modified with ionic liquids differing in the length of the side chain in the imidazolium cation, (ii) TiO_2 modified with ionic liquids differing in the type of anion and (iii) TiO_2 modified with ionic liquids differing in the type of cation containing nitrogen in its structure. It was shown that both the type and content of the ionic liquid in the reaction system strongly determined the properties of the TiO_2 samples. The morphology and surface properties of the obtained TiO_2 microparticles were related with the ability to adsorb of ILs on the surface of TiO_2. Then the ionic liquids acted as a structure-directing agent by controlling particle growth and preventing the agglomeration due to high dielectric constant, polarity, amphiphilic properties and the presence of positive and negative charges.