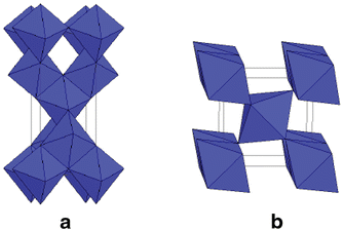
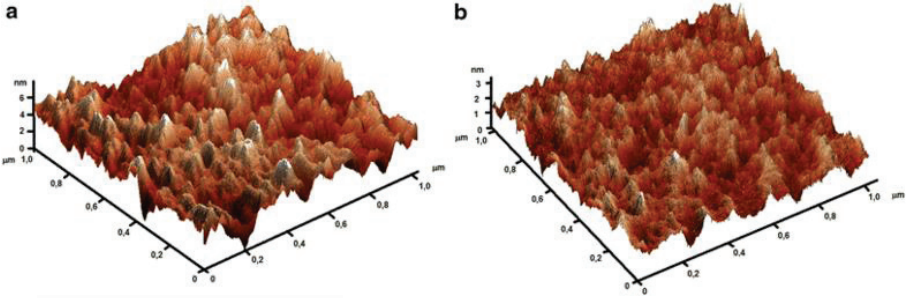
Research (What is it about?)	**Organo-inorganic copolymers with high catalytic activity**
UNN authors	*Smirnova L.A., Salomatina E.V.*
We find (The result)	The nanocomposite copolymers of ***poly(titanium oxide)*** in an organic matrix of poly(hydroxyethyl methacrylate) doped by the ***Au nanoparticles*** were synthesized. The synthesized materials have high photocatalytic activity under UV irradiation.
Abstract	The interest to the TiO_2-based materials appeared when it was discovered the phenomenon of water decomposition on the TiO_2-made anode under the UV-irradiation. The photocatalytic peculiarities of TiO_2 are the result of the reversible single-electron transition of $Ti^{4+}+e^- \rightarrow Ti^{3+}$. In this case the charge carriers - holes and electrons—are formed on the material surface due to absorption of UV-irradiation with the wavelength corresponding to the TiO2 band gap. But this band gap is wide (3.2 eV) that restricts the wavelength range of the charge carriers generation by the UV region only. The recombination rate of charge carriers is high so the quantum yield of the transition to Ti_{3+} is only~12–17%. One can solve this problem by doping Au nanoparticles which have high absorption in the visible region (510–550 nm) due to plasmonic resonance (collective excitations of electrons on the surface of the nanoparticles). The excited electrons on the surface of Au nanoparticles are transferred to the conducting band of TiO_2. In order to increase the catalytic activity of TiO2 it is necessary to produce the highly dispersed material. The way to do that is the formation of the polymeric composites containing TiO_2 as nanoparticles. We describe the formation method of the optically transparent composition materials containing highly dispersed poly(titanium oxide) doped with Au nanoparticles in an organic polymer matrix in a *one-pot reaction.* The Au nanoparticles are formed by the UV-irradiation the polymeric matrix containing $HAuCl_4$. The photocatalytic properties of poly(titanium oxide) doped with Au nanoparticles in the organic matrix of poly(hydroxyethyl methacrylate) were tested in the well investigated reaction of methylene orange (***MO***) decomposition under the broad spectrum UV-irradiation (high pressure mercury arc lamp). The photocatalytic activity of nanocomposite has been found twice as much compared to existing photocatalysts. New polymeric composite is a prospective material for the development of high-effective membrane-type photocatalysts.

Representative articles 2016-2017, quartiles	1. *Salomatina E.V., Loginova A.S., Ignatov S.K., Drozdov M.N., Knyazev A.V., Spirina I.V., Smirnova L.A.* Structure and catalytic activity of organo-inorganic copolymers containing poly(titanium oxide) and nanoparticles of Au. J. Inorg. Organomet. Polym. Mater. **26**(6), 1280-1291 (2016).	–
	Q-index (Qi) of the result	**0**

In collaboration	–

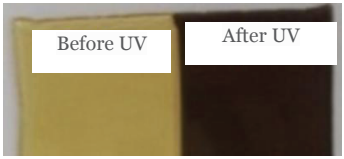


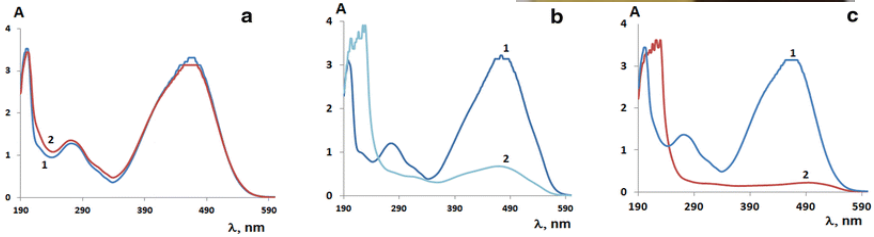
Among three allotropic modifications of TiO_2 (anatase, rutile and brookite) only the anatase (a) and its mixture with small amount rutile one (b) are catalytically active.



The surface topography of samples without (a) and with (b) Au nanoparticles.

Transparency of samples





The absorption spectrums of the 0.1 wt% MO aqueous solutions before (curve *1*) and after 480 min (curve *2*) of UV-irradiation: a—blank experiment; b—copolymer without Au; c—copolymer with 1 wt% Au nanoparticles.

The changing of MO concentration during UV-irradiation: *1*—blank experiment; *2*— copolymer without Au; *3*—copolymer with Au nanoparticles