Laser-assisted ablation of UiO-66 metal-organic framework on the PET surface for novel electrode materials

Dmitry Kogolev*, Oleg Semyonov, Maksim Fatkullin, Olga Guselnikova, Pavel S. Postnikov**
Tomsk Polytechnic University, 634050 Tomsk, Russian Federation
*E-mail: kogolev@tpu.ru, **E-mail: postnikov@tpu.ru

Currently, one of the main trends in the chemistry of MOFs is their use as a raw material for the production of carbon-based nanomaterials, which have a high potential for further use as electrocatalysts. However, despite the steady progress in the development of technologies, carbonization is a complex and energy-intensive process that requires optimization and search for new solutions.

Recently, a Zhou's team of researchers from China and Singapore and co-workers has proposed a new approach towards the carbonization of thin layers of MOFs under the laser irradiation (Adv. Funct. Mater., 2021, 31, 2009057). As a result, the ordered and porous graphene nanostructures have been formed. In addition, metal inclusions of various nature, formed during laser processing, increased the physical and mechanical perfomance of the resulting material.

In this work, we developed a novel approach towards laser treatment of UiO-66 thin films immobilized on a nonconductive PET substrate. The structure of the composite material was evaluated using various techniques (XRD, FTIR, Raman, UV-Vis, XPS, SEM-EDX etc.), (Figure 1).

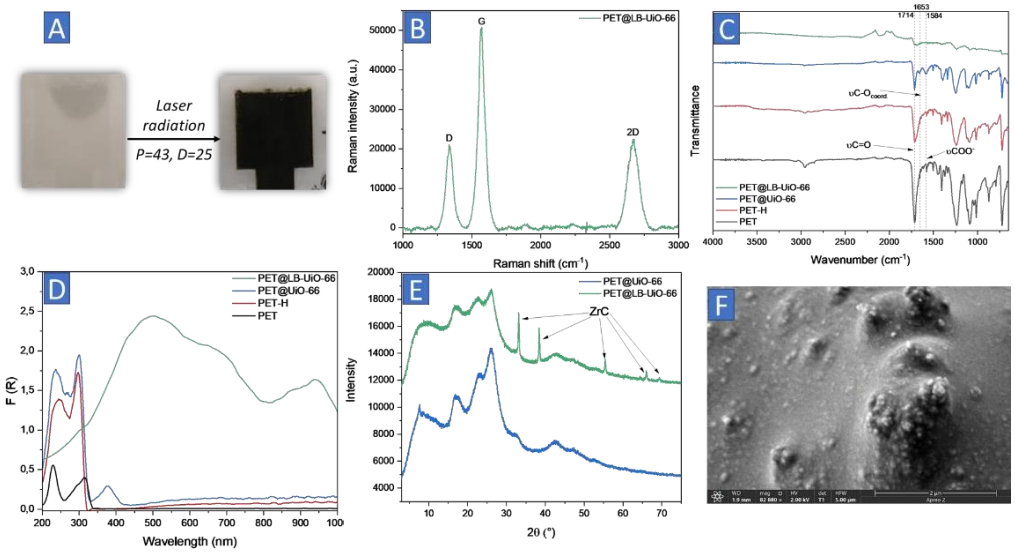

Figure 1 – (A) Images of PET@UiO-66 before and after laser radiation; (B) Raman spectra of PET@LB-UiO-66; (C) FTIR spectra of PET, PET-H, PET@UiO-66 and PET@LB-UiO-66; (D) UV-Vis spectra of PET, PET-H, PET@UiO-66 and PET@LB-UiO-66; (E) XRD pattern of PET@UiO-66 and PET@LB-UiO-66; (F) SEM image of PET@LB-UiO-66

Acknowledgement
This research was supported by PHC Kolmogorov № 075-15-2022-244.