

Supporting Information

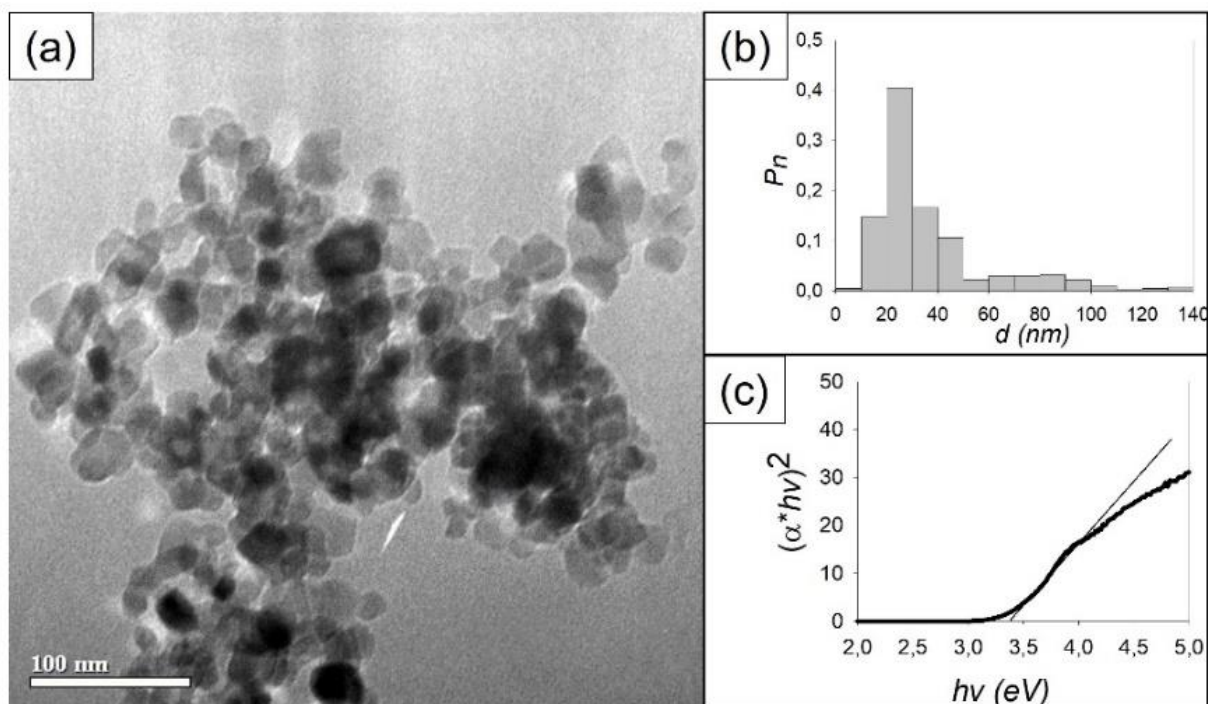


Figure S1. Characterization of TiO₂ nanoparticles: (a) – TEM microphotograph of TiO₂ nanoparticles; (b) – particle size distribution based on the analysis of over 1000 particles, P_n being the numerical fraction in the certain range of the diameter; (c) – Tauc plot, determination of the effective band gap of the TiO₂ sample.

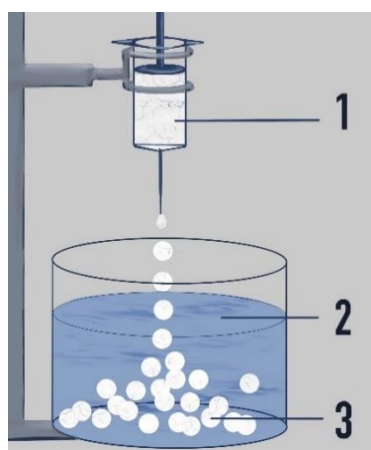


Figure S2. Schematic representation of the Alg-Ca@PAAm@TiO₂ hydrogel beads production. 1 – syringe with gel precursor; 2 - precipitation bath with CaCl₂ aqueous solution; 3 – the hydrogel beads.

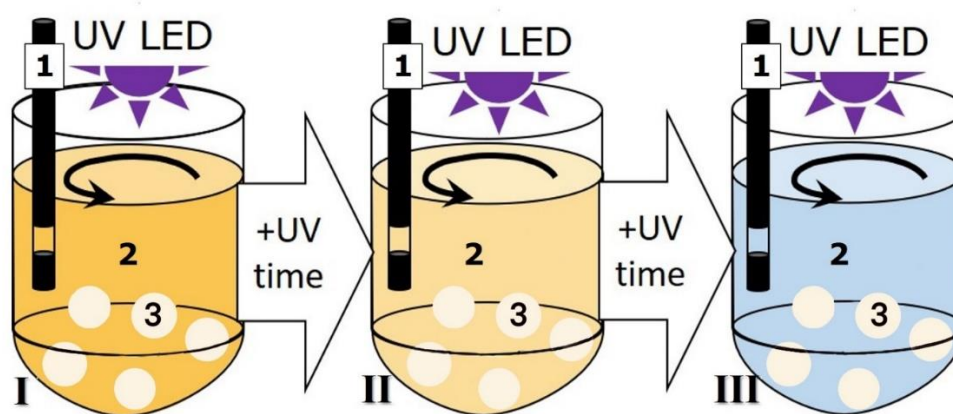


Figure S3. Experimental setup for the measurement of photocatalytic activity of hydrogel photocatalysts in methyl orange dye aqueous medium. 1 - optical fiber probe, 2 - overhead stirrer, 3 - composite hydrogel beads. Marks I, II, III correspond to the appearance of the reactor at the beginning, in the middle and at the end of the photocatalytic experiment.



Figure S4. Experimental setups for hydrogel irradiation. Each UV-LED module (UV-module) has 3 LED emitting light at 365 nm with 3W per each LED giving 9W in sum. (a) and (b) – the setups for irradiation hydrogel in cell as prepared; (c) – the setup for hydrogel irradiation within PVC-ring in water media. The blue caps were used to prevent any reflection of UV light to avoid indirect irradiation of hydrogel's back side. The water volume and distance to UV-module was the same for both hydrogels (PAAm@Mo₁₃₂ and PAAm@Mo₁₃₂@TiO₂).

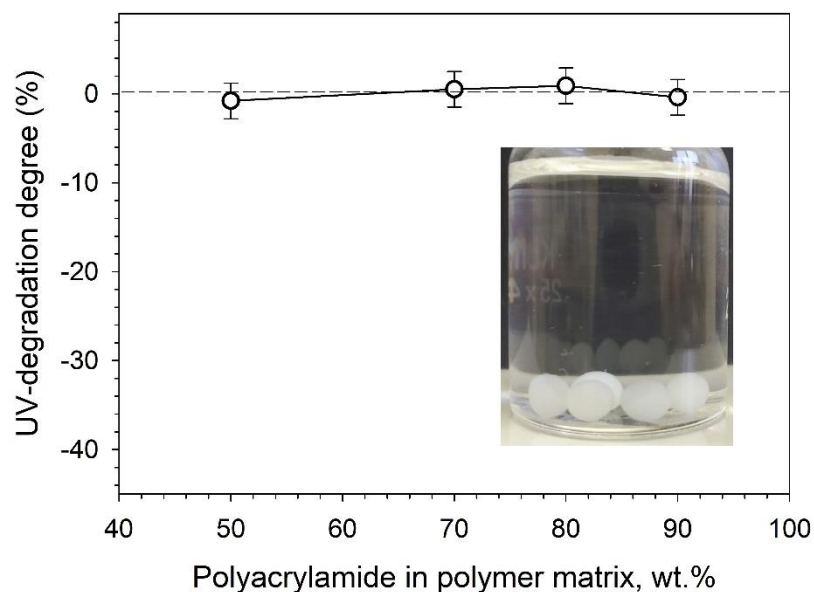


Figure S5. The photostability of the Alg-Ca@PAAm@TiO₂ hydrogel beads with various PAAm contents. The insert presents the appearance of the hydrogel beads with 50 wt.% of PAAm after 5h UV-irradiation.

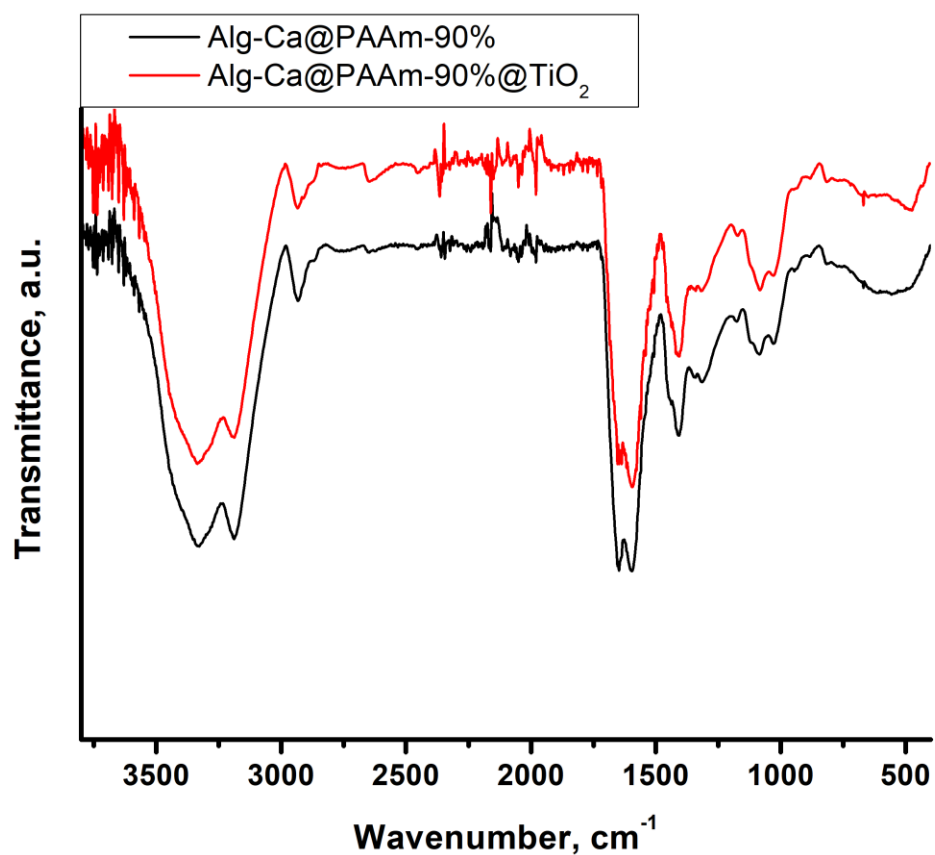


Figure S6. The IR spectra of swelled Alg-Ca@PAAm@TiO₂ and Alg-Ca@PAAm hydrogels (with PAAm 90% of content) after one-year storage in distilled water.

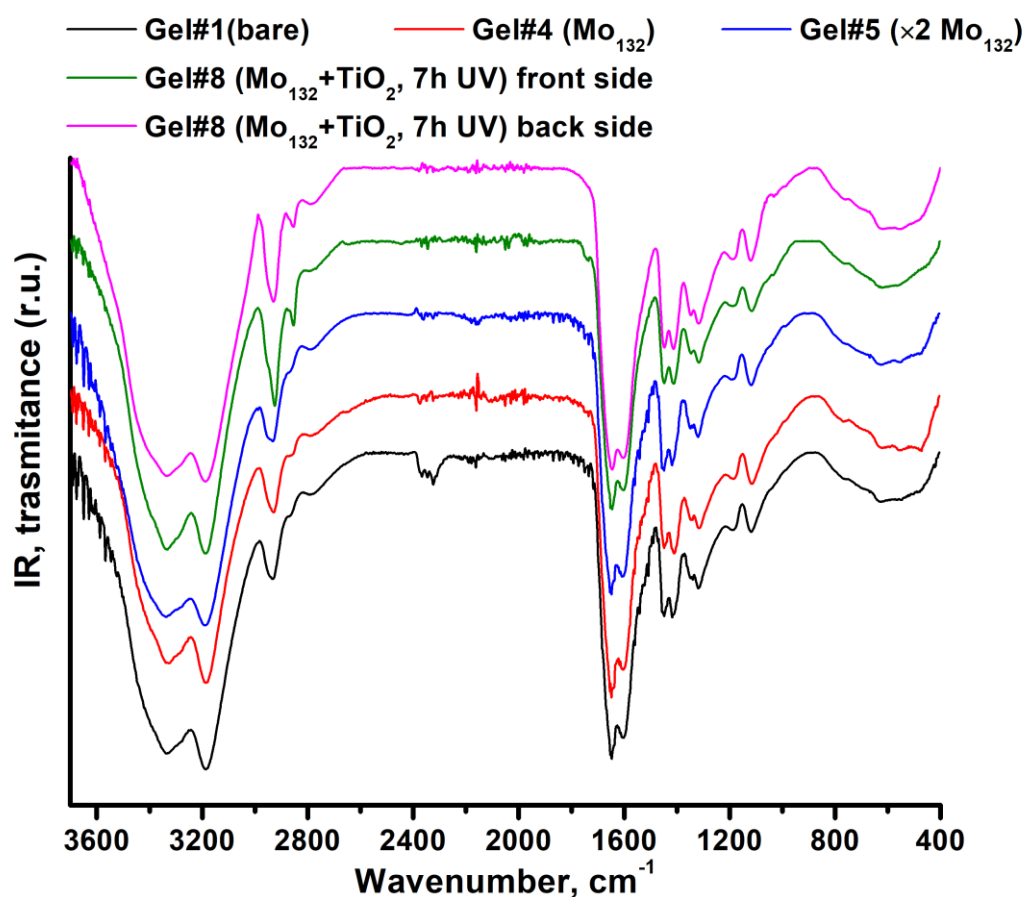


Figure S7. The FT-IR spectra of hydrogel measured in the ATR mode. For sample code see the manuscript.

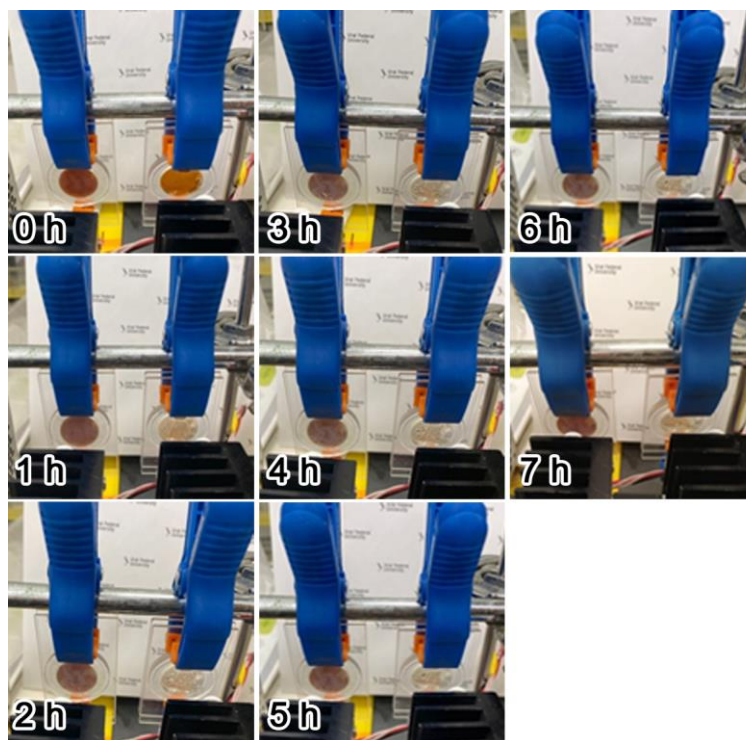


Figure S8. The images of the PAAm@Mo₁₃₂@TiO₂ (left gel) and PAAm@Mo₁₃₂ (right gel) hydrogels during the UV irradiation for 7 h in the cell.

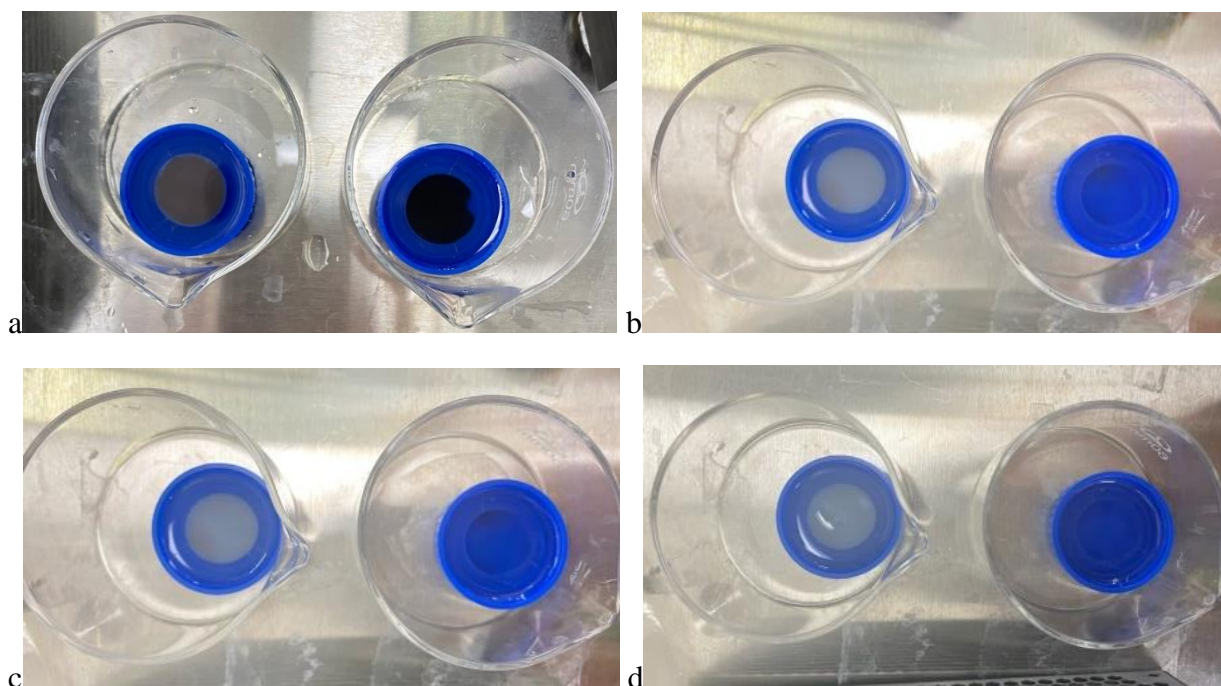


Figure S9. The images of the PAAm@Mo₁₃₂@TiO₂ (left gel) and PAAm@Mo₁₃₂ (right gel) hydrogels during the UV irradiation for 3 h in the aqueous solution: 0 h (**a**), 1 h (**b**), 2 h (**c**) and 3 h (**d**).



Figure S10. The images of the front (irradiated) and back (nonirradiated) sides of the PAAm@Mo₁₃₂@TiO₂ hydrogel after the UV irradiation for 3 h in the aqueous solution.

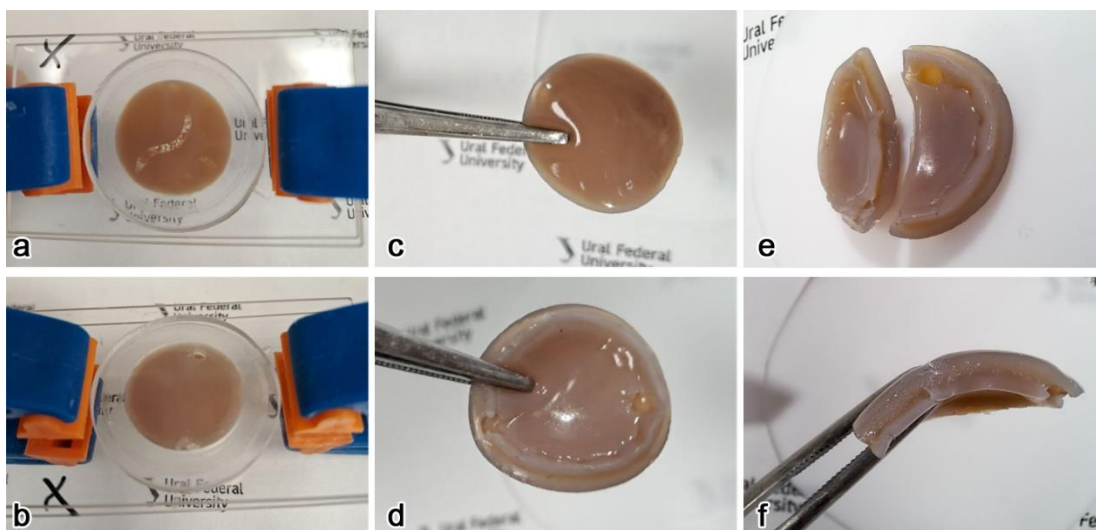


Figure S11. The images of the PAAm@Mo₁₃₂@TiO₂ hydrogel after the UV irradiation for 4.5 h (a – front side, b – back side) and 9 h (total time) in the cell (c – front side, d – back side). (e, f) – The cut hydrogel after 9 h.

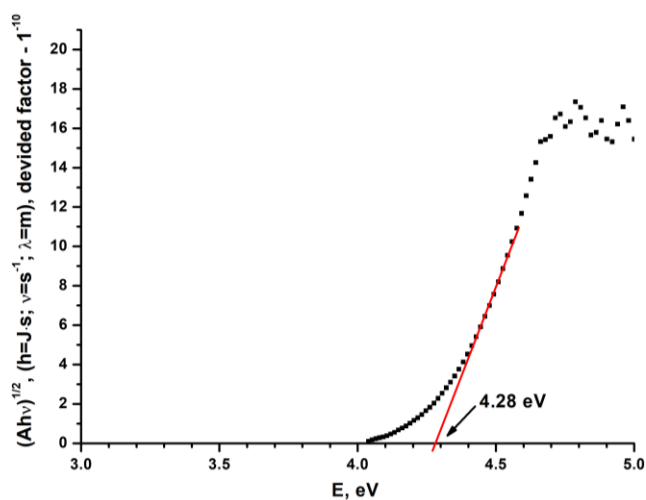


Figure S12. The Tauc's plot for UV-Vis spectrum of the acrylamide aqueous solution (7.5 g·L⁻¹).