High-Pressure High-Temperature nanodiamond-modified ZnO nanocomposites as promising photocatalysts: synthesis and characterization

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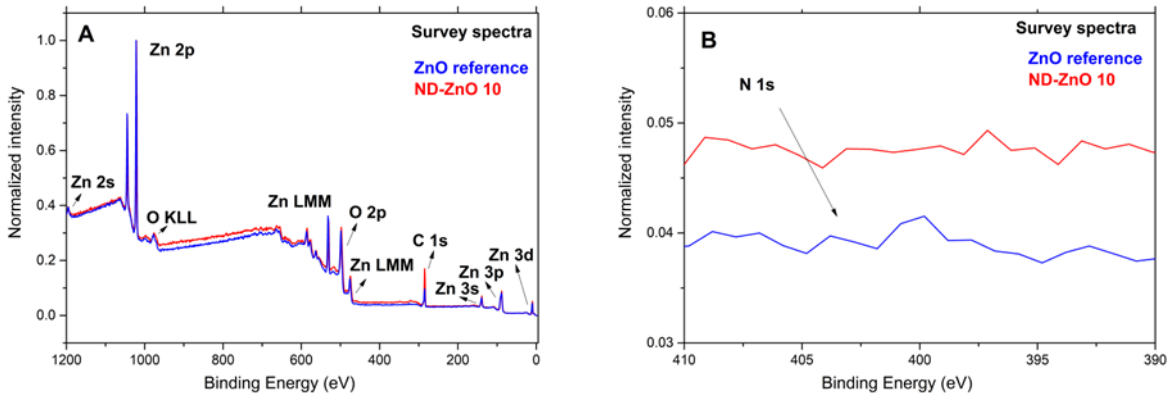


Figure S1. Comparison of the normalized A XPS survey spectra and B magnification regions (390-410 eV) of the survey spectra of reference ZnO and ND-ZnO 10 samples.

The comparison of the normalized XPS survey spectra of reference ZnO and ND-ZnO 10 samples demonstrated in Figure S1 revealed the low signal of nitrogen on the surface of the reference ZnO (see Figure S1B, magnification region). In addition, the high-resolution N 1s peak was measured in the case of reference ZnO, as shown in Figure S2, and XPS analysis revealed the presence of ~ 2.5 at.% (Table 1) of nitrogen on the surface of the reference ZnO. The intensity of the N 1s peak was rather low and the shape was noisy; however, it could be assumed that the peak was located at about 399.9 eV and could be a reference to some amide groups. Thus, the presence of a low amount of nitrogen in reference ZnO could be attributed to the adsorption of nitrogen-containing species from the atmosphere during the sample handling. As for the ND-ZnO 10 sample, no significant evidence of N 1s peak signal was observed in the XPS survey spectra (probably due to the rather low amount of N and the detection limits of the used XPS spectrometer). This confirmed that negligible nitrogen-containing species were introduced during the preparation of the ND–ZnO composites and that nitrogen was not incorporated into the ZnO lattice.

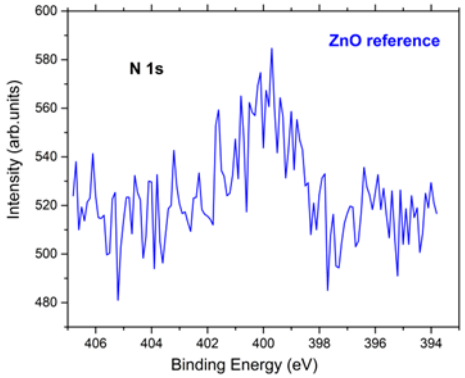


Figure S2. The high-resolution N 1s peak detected on the surface of the reference ZnO sample.

Table S1. ZnO-based photocatalysts modified with various carbon nanomaterials for the photocatalytic degradation of methylene blue (MB) under UV irradiation.

Photocatalyst system	**Carbon modifier**	**MB degradation efficiency**	**Reference**
C-doped ZnO	Carbon from plant extract	~62%	[64]
ZnO/CDots	Carbon dots	~80%	[65]
ZnO/ACF	Activated carbon fibers	~78–99%	[66]
ZnO/CNT	Carbon nanotubes	~90–99%	[67]
ZnO/MWCNT	Multi-walled CNT	~99%	[68]
ZnO–rGO	Reduced graphene oxide	~86–99%	[69,70]
ZnO–GO	Graphene oxide	~75–99%	[71]
HPHT ND–ZnO (this work)	HPHT nanodiamond	**~98%**	This work

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