Supporting Information

Morphology Effect on Zinc Oxide Quantum Photoinitiators for Radical Polymerization

Authors: Alex Pinkas, Nir Waiskopf, Shira Gigi, Tom Naor, Almog Layani and Uri Banin*

The Institute of Chemistry and the Center for Nanoscience and Nanotechnology, The Hebrew University of Jerusalem, Jerusalem 91904, Israel.

* Corresponding author. Email: uri.banin@mail.huji.ac.il

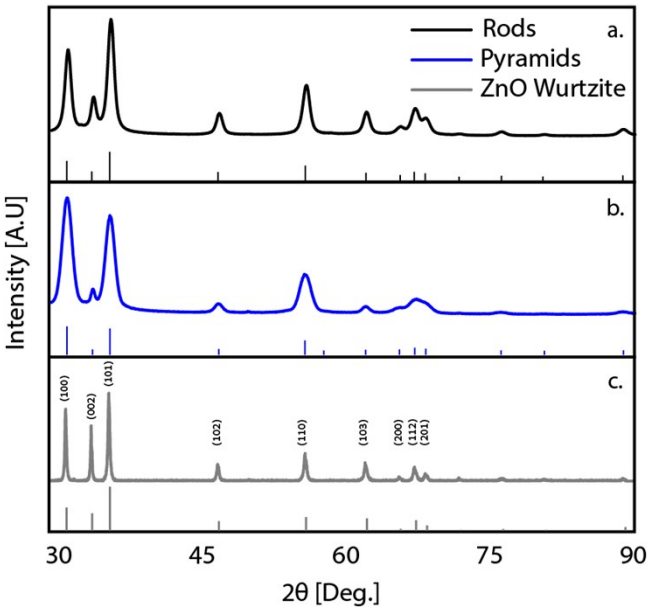

Figure S1. XRD of as synthesized ZnO nanoparticles: (a) ZnO nanorods. (b) ZnO pyramids (c) literary wurtzite ZnO XRD spectrum.[1]

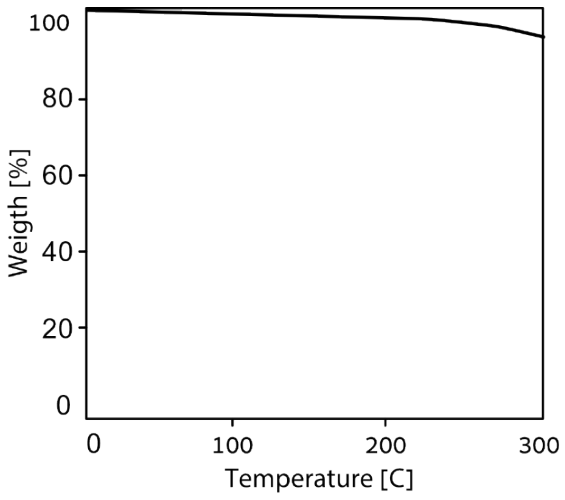

Figure S2: Thermal-gravimetric analysis of ZnOr after a single cleaning cycle showing only slight weight loss after heating to 300°C, indicating minimal organic content.

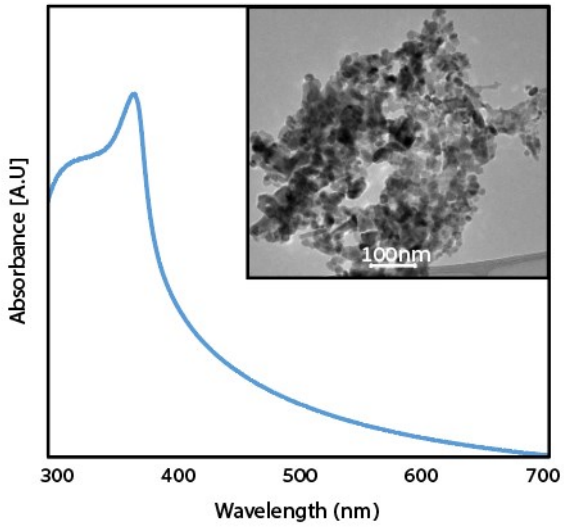

Figure S3. Absorbance spectrum of commercial ZnO nanoparticles. Inset: TEM image of the particles. The spectrum shows a scattering feature in the range of 400-700nm, which is compatible with the aggregation seen in the TEM images.

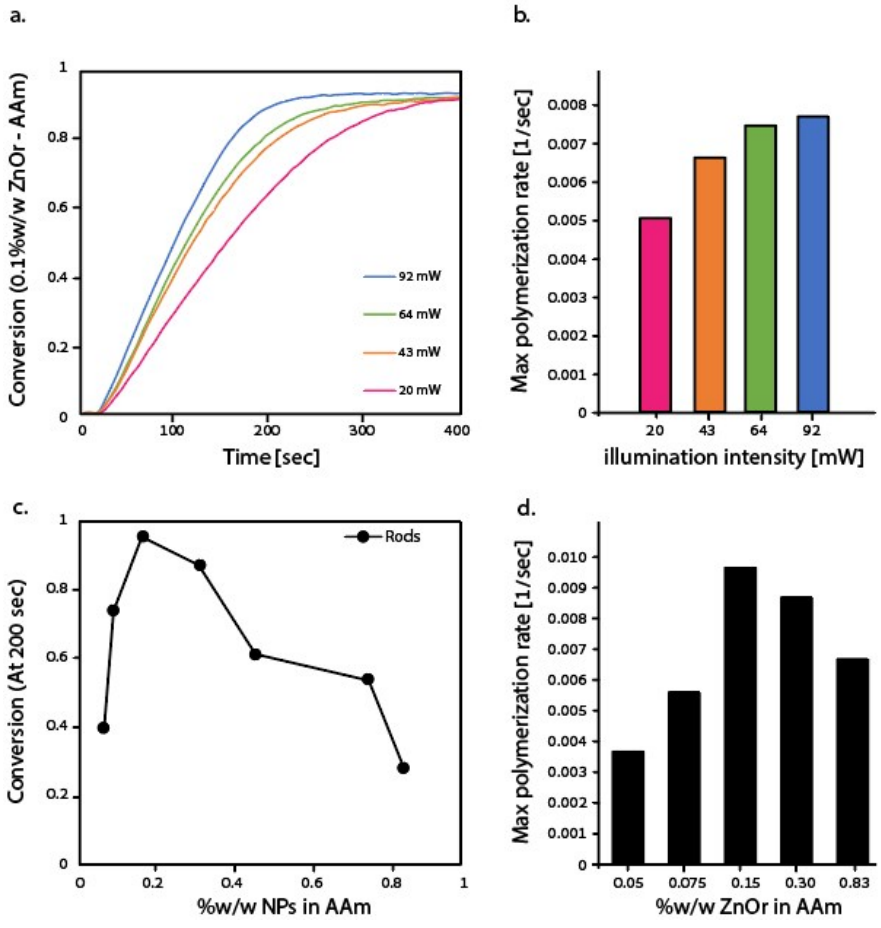

Figure S4. Characterization of the water-based polymerization of the acrylamide (AAm) formulation: (a) Conversion as a factor of the illumination intensity with 0.1%w/w of ZnO nanorods. (b) Max polymerization rates as a factor of the illumination intensity. (c) Conversion at 200sec as a factor of the ZnO %w/w. (d) Max polymerization rates as a factor of the ZnOr %w/w.

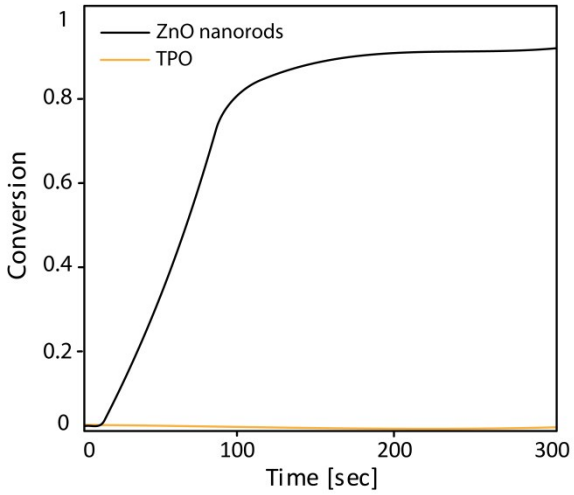

Figure S5. Comparison of the photoinitiation activity in solvent-free formulation for the same molar concentration (0.4µM) of ZnO nanorods and the organic photoinitiator diphenyl(2,4,6-trimethylbenzoyl)phosphine oxide (TPO), demonstrates the higher efficiency of the former.

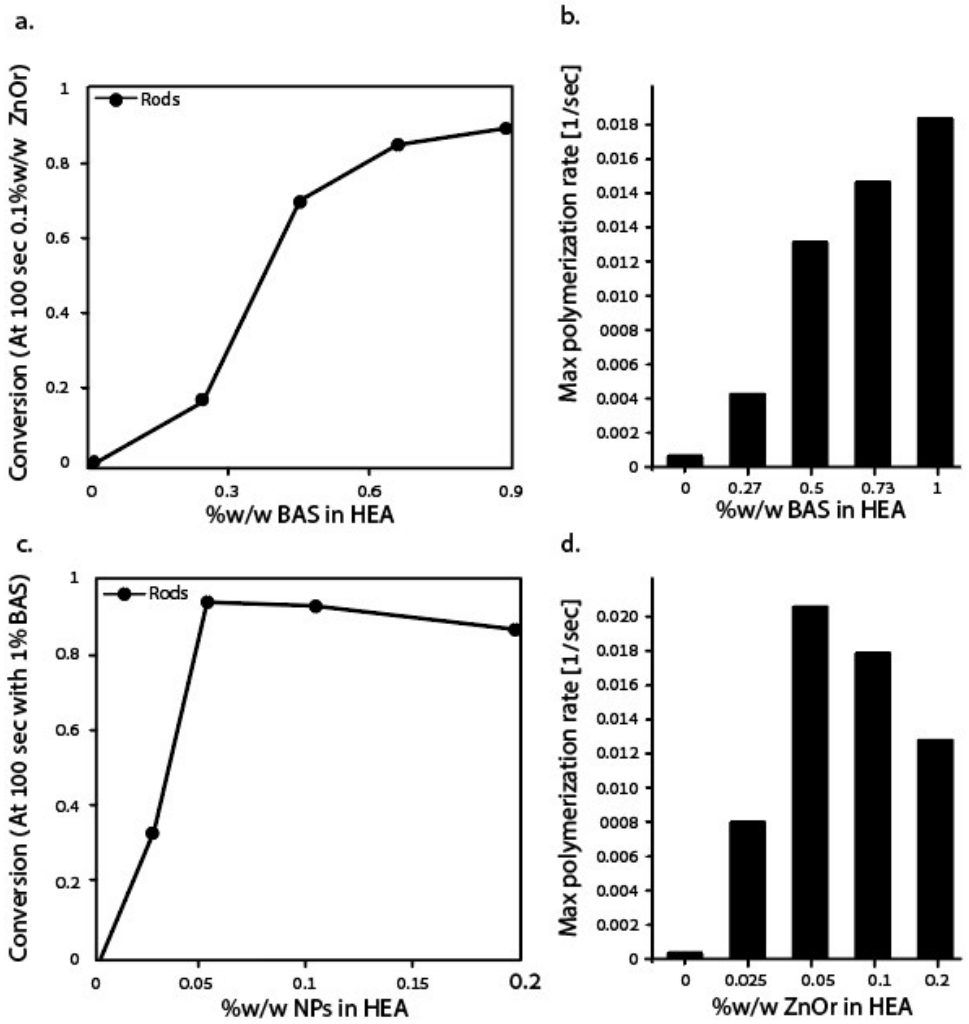

Figure S6. Characterization of the solvent-free polymerization 2-Hydroxyethylacrylate (**HEA**): (a) Conversion as a factor of benzoylformic acid salt (BAS) %w/w with 0.1%w/w of ZnO rods. (b) Max

polymerization rates as a factor of BAS %w/w. (c) Conversion as a factor of the ZnO %w/w in the presence of 1%w/w of BAS. (d) Max polymerization rates as a factor of ZnOr %w/w.

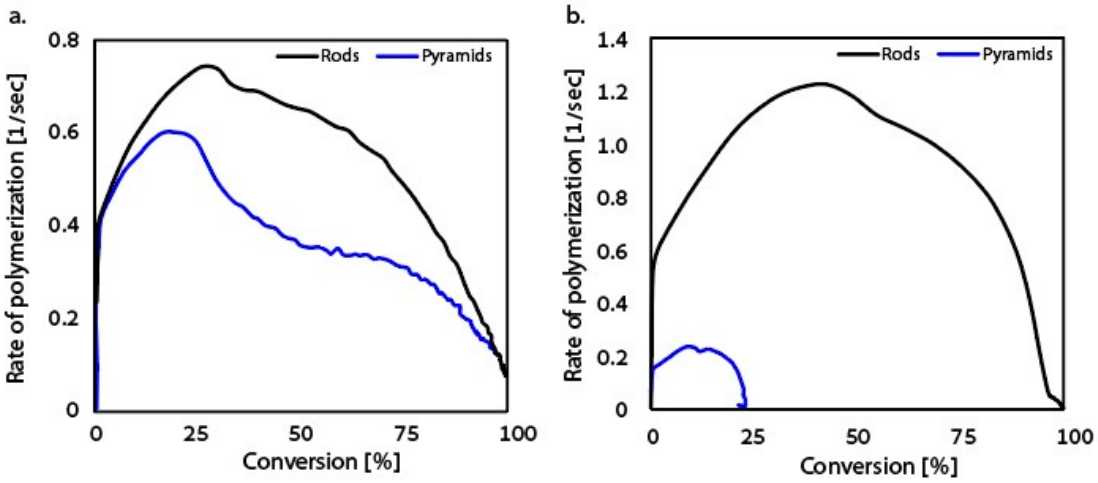

Figure S7. Rate of polymerization as a factor of the percent of conversion. More specifically, how fast does the conversion change at every step of polymerization, based on figure 2 in the main manuscript. (a) Rate of polymerization as a function of conversion of acrylamide formulation. (b) Rate of polymerization as a function of conversion of HEA formulation.

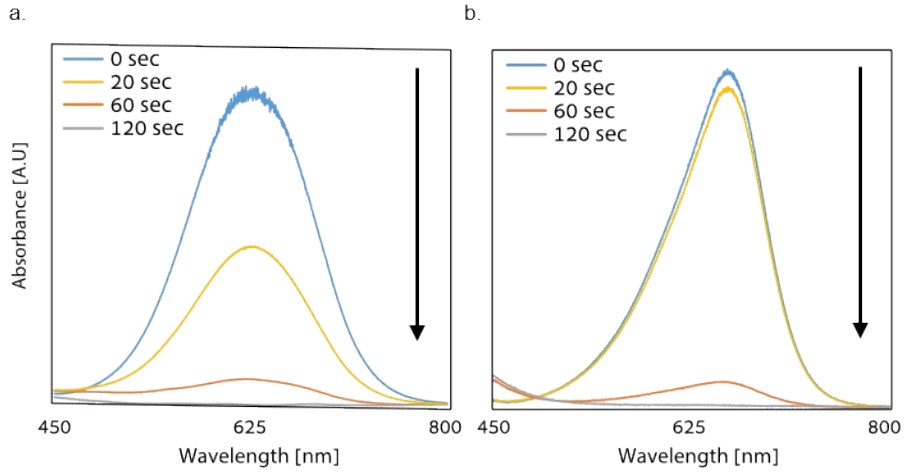

Figure S8: Dye absorbance decreases over time during illumination with 365nm LED in the presence of ZnO rods at 1OD at 365 nm. (a) DCPIP reduction in NMF. (b) Bromocresol green oxidation in NMF. The arrow indicating on the decrease in the signals with the illumination time.

References

1 K. Kihara and G. Donnay, Can. Mineral., 1985, **23**, 647–654.