Electronic Supplementary Material (ESI) for Nanoscale

Supporting Information

Bottom-upSynthesis of $Zn_{1.7}GeN_{1.8}O$ Nanoparticles for Photocatalytic Application

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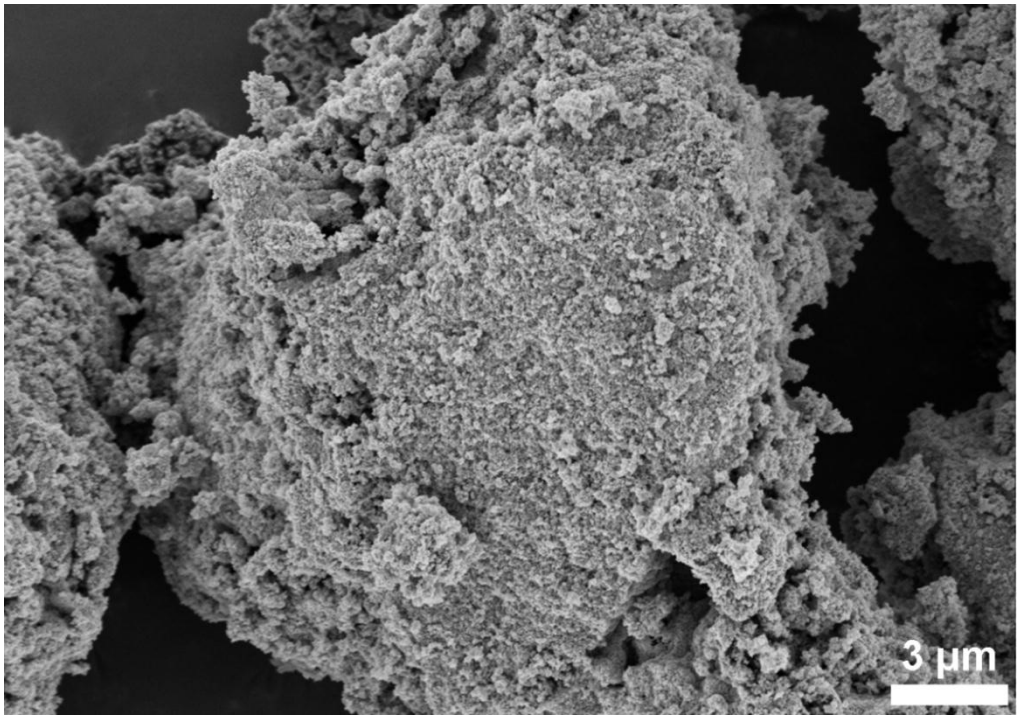

Figure S1. SEM image of the $Zn_{1.7}GeN_{1.8}O$ particles synthesized with the urea pathway in the presence of ammonium chloride at 800 °C.

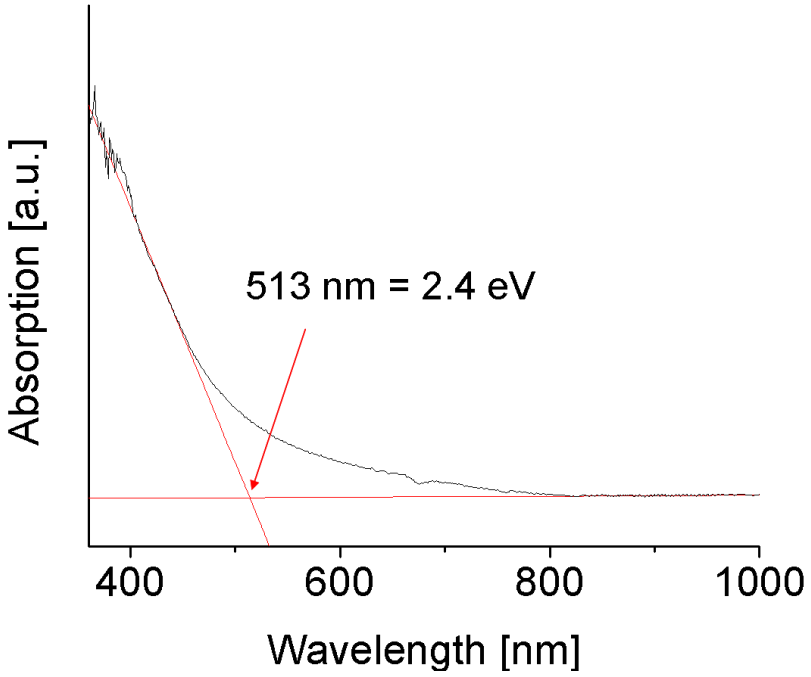

Figure S2. Absorption spectra of $Zn_{1.7}GeN_{1.8}O$. The band gap energy was determined, following a procedure described by A. E. Morales *et al.*[S1] Therefore two linear fits for the absorption slope (y = 16511.06 + 0.06x) and for the background at lower energy (y = 31094.0 – 28.33x) were done. The intersection of the two linear fits was determined to be at x = 513 nm, which corresponds to a band gap energy of 2.4 eV.

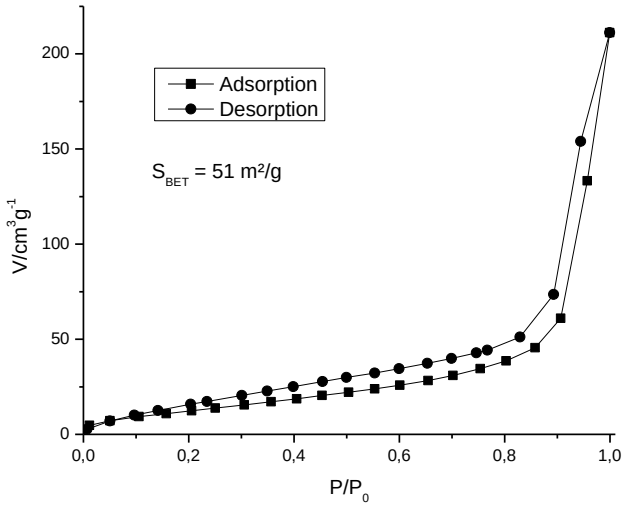

Figure S3. In order to determine the surface area of the $Zn_{1.7}GeN_{1.8}O$ particles synthesized in the presence of ammonium chloride at 800 °C, a Brunauer-Emmett-Teller (BET) –slope using nitrogen gas was measured. The surface area is determined to be 51 m^2/g.

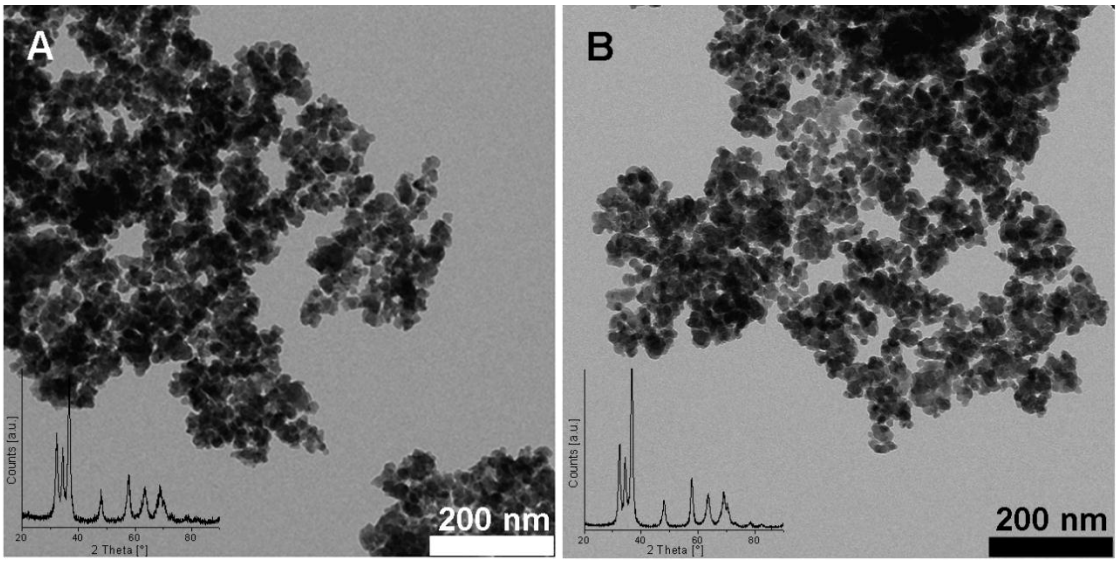

Figure S4. TEM images of $Zn_{1.7}GeN_{1.8}O$ synthesized (A) with the recipe described in the experimental section and (B) with the tenfold up-scaled version of the recipe. The insets show the XRDs of the samples.

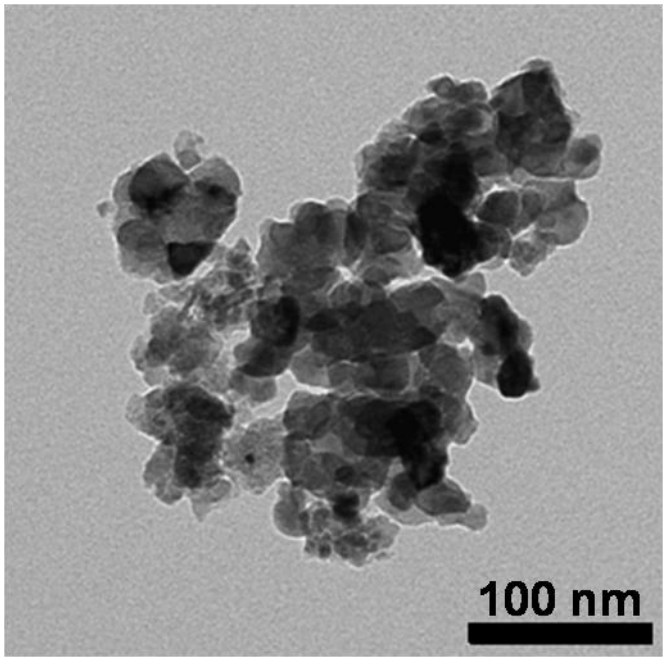

Figure S5.TEM image of particles synthesized in the absence of ammonium chloride at 900 °C.

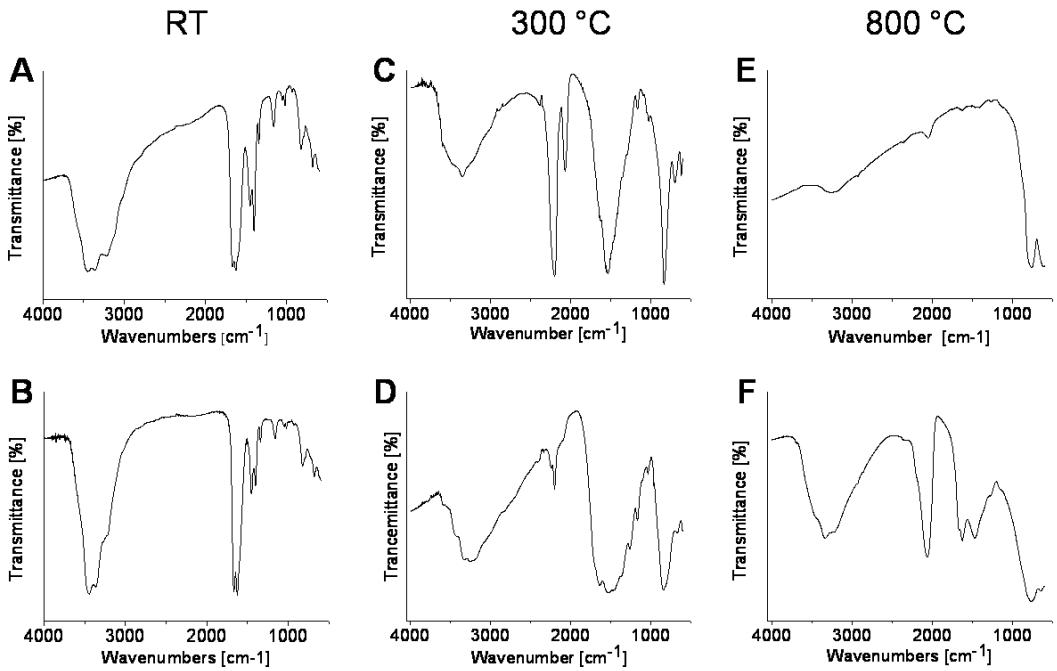

Figure S6. Evolution of the Infrared spectra in the presence and absence of ammonium chloride at different temperatures. A: the reaction mixture containing ammonium chloride at room temperature; B: the reaction mixture in the absence of ammonium chloride at room temperature; C: the reaction mixture containing ammonium chloride at 300 °C; D: the reaction mixture in the absence of ammonium chloride at 300 °C; E: the reaction mixture containing ammonium chloride at 800 °C; F: the reaction mixture in the absence of ammonium chloride at 800 °C.

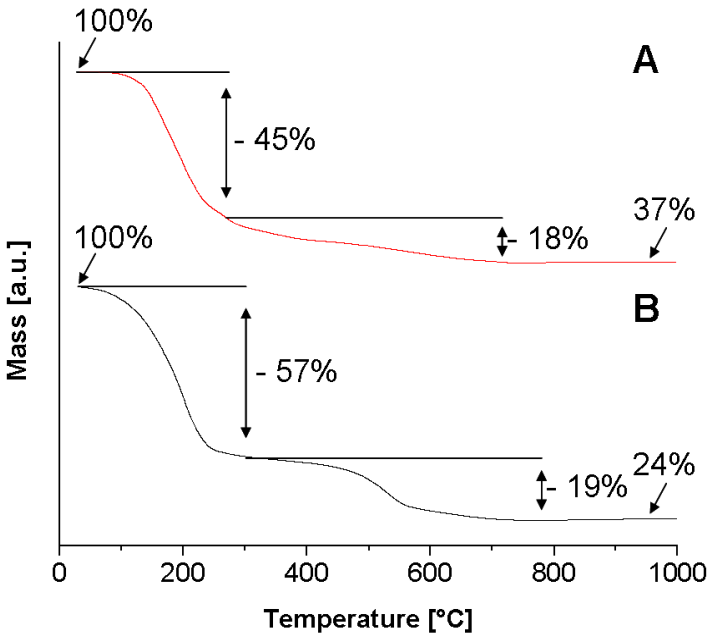

Figure S7. Comparison of the thermo gravimetric measurements under nitrogen atmosphere A) in the absence and B) in the presence of ammonium chloride. A different dependency of the mass lost on the temperature is observed. The presence of ammonium chloride leads to an

increased mass loss at low temperatures and thus to the formation of a nitrogen rich atmosphere.

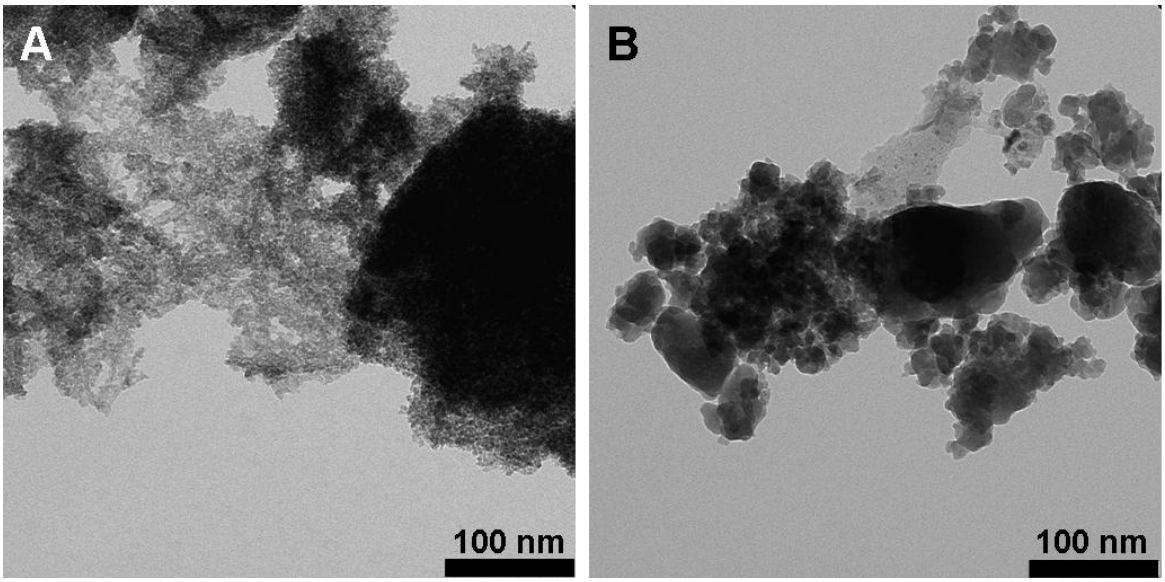

Figure S8.TEM images of the particles synthesized at 600 °C in the presence (A) and in the absence (B) of ammonium chloride. The presence of ammonium chloride leads to the formation of small and homogeneous particles.

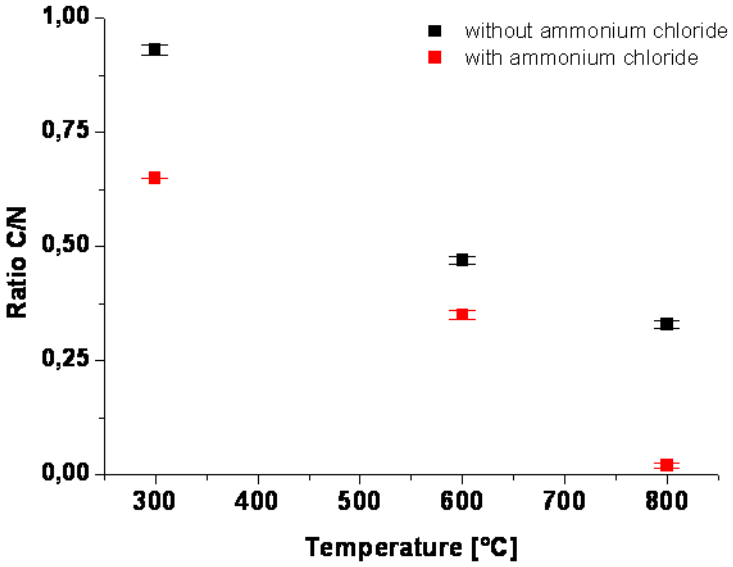

Figure S9. The amount of carbon and nitrogen in the samples synthesized at different temperatures was measured by elemental analysis. The plot illustrates the dependence of the ratio between C/N and the reaction temperature. The ratio of C/N was used as an indication for the progress of the reaction.

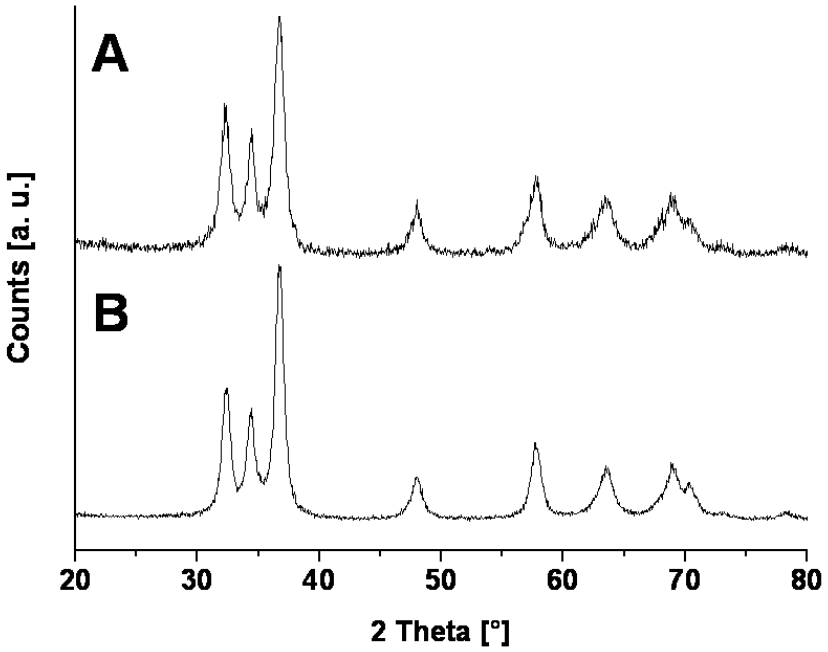

Figure S10. XRDs of the particles (A) after the catalytic measurements compared to the particles (B) before the catalytic measurements. Both show the typical reflexes of $Zn_{1.7}GeN_{1.8}O$ (ICDD 00-024-1443).

[S1] A. E. Morales, E. S. Mora, U. Pal, *Rev. Mex. Fis. S*2007,**53,** 18.