Functionalization of MgZnO nanorod films and characterization by FTIR microscopic imaging

Metal organic chemical vapor deposition grown films consisting of $Mg_xZn_{1-x}O$ (4% < x < 5%) nanorod arrays ($MgZnO_{nano}$) were functionalized with 11-azidoundecanoic acid.

Sample preparation

5 drops of a 10 mM solution of either 2:1 1-butanol/ethanol or 3-methoxypropionitrile was deposited onto a pristine $MgZnO_{nano}$ film grown on a sapphire substrate placed flat in a glass Petri dish, which was then sealed to prevent evaporation. After reacting for a time between 0.5 and 2h, the film was thoroughly rinsed with neat solvent and then dried under gentle nitrogen flow.

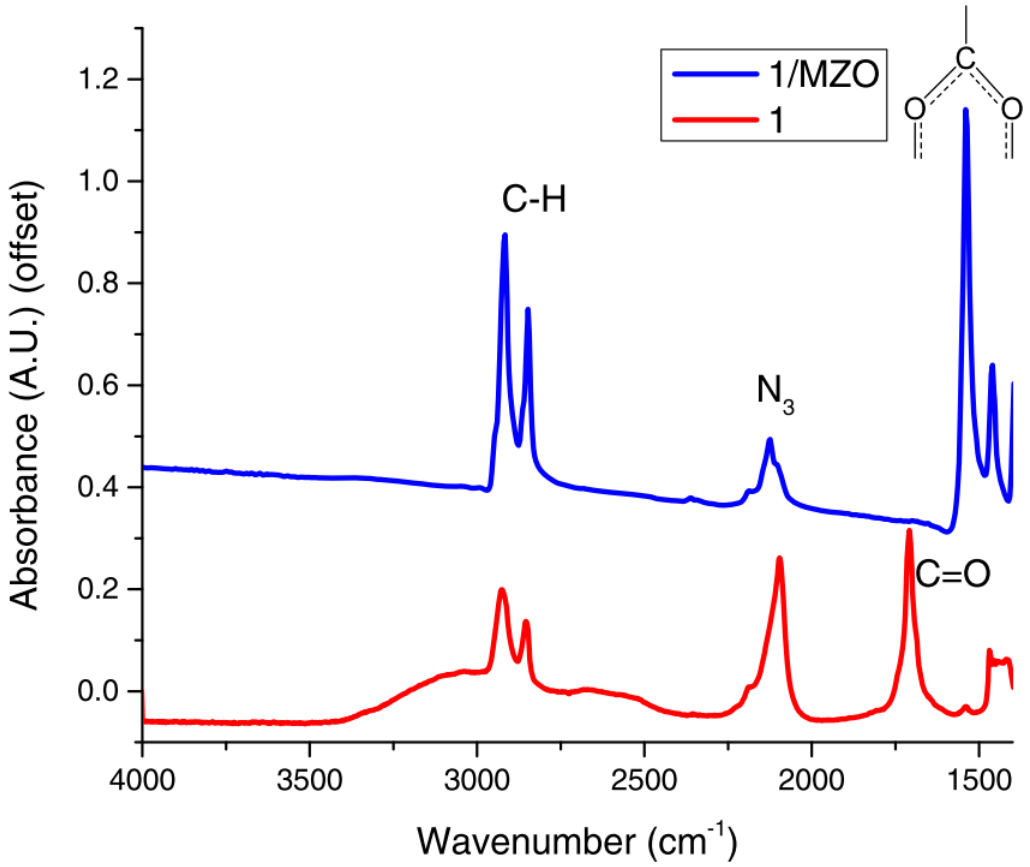
Data acquisition conditions

FTIR microscopic images of $MgZnO_{nano}$ films were collected with a Perkin-Elmer Spotlight 300 system in the transmission mode with an essentially linear array (16 × 1) of mercury-cadmium-telluride (MCT) detector elements. The spectral range was limited to the 4000–1400 cm^{-1} region due to the intense background of the MgZnO/c-sapphire films

Results

The azido group in 11-azidoundecanoic acid has a characteristic, intense asymmetric stretching (ν_{as}(N = N = N)) band at 2096 cm^{-1}, which serves as an IR tag. This band shifted to 2130 cm^{-1} after binding onto $MgZnO_{nano}$.

The COOH group undergoes characteristic spectral changes upon binding, similar to those observed for binding to other nanostructured metal oxides. Overall, the spectral changes of the COOH group and the presence of the ν_{as}(N=N=N) band are consistent with covalent binding through the COOH group



FTIR-ATR spectrum of neat 11-azidoundecanoic acid (**1**) (bottom, red line) and representative single pixel FTIR spectrum of 1/ $MgZnO_{nano}$ (top, blue line)

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