Supplementary Information

Fig. S1: FTIR spectrum of ZnO nanoparticles synthesized at \( W_0 = 13.34 \).

Fig. S2: XRD diffractograms of (a) ZnO nanoparticles and (b) ZnO@Ag core@shell nanoparticles synthesized at \( W_0 = 13.34 \).

Fig. S3: EDX spectra of (a) ZnO nanoparticles and (b) ZnO@Ag core@shell nanoparticles synthesized at \( W_0 = 13.34 \).

Fig. S4: Energy band structure of Ag and ZnO showing formation of new Fermi level by back-donation of electrons.
Fig. S5: Size distribution of the reverse micelle in w/o microemulsion of TX-100/hexanol/cyclohexane at $W_o=13.34$.

Fig. S6: FESEM image of ZnO@Ag core@shell nanoparticles synthesized at $W_o=13.34$ taken at (a) high (15 kV) and (b) low (10 kV) accelerating voltage revealing the size of the core and the shell.

**XRD instrumentation**
Philips PW 1724 X-ray generator using XDC-700 Guinier-Hagg focusing camera with strictly monochromatized Cu Kα, radiation ($\lambda = 1.540598$ Å).
Exposure time was 15 minutes at 40 kV-30 mA on an image plate. After exposure, the image plate was scanned using HD-CR 35 NDT/CR 35 NDT scanner.

**Scanning Electron Microscope instrumentation**
JEOL analytical scanning electron microscope, model JSM-6490LA

**Energy Dispersive X-Ray (EDX) instrumentation**
JEOL analytical scanning electron microscope, model JSM-6490LA

**Field Emission Scanning Electron Microscope instrumentation**
FESEM JEOL 7600F

**Particle Size Analyzer**
NANO ZS90, ZEN 3690

**Fourier Transform Infrared (FTIR) Spectrometer**
Perkin Elmer FTIR-NIR spectrometer

**UV-visible Spectrometer**
UVD-500 (Labomed, USA)