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With lots of love and gratitude, I dedicate this to my beloved parents, my wife and my lovely daughter and closest friend.

Each of you always makes me feel special and thank you for believing in me.
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ABSTRACT

Metal oxide semiconductors have been widely studied due to its wide properties and applications. Among them, nickel oxide (NiO) is an important metal oxide which contributes to a wide range of applications in gas sensors, fuel cell electrodes, catalysis and optoelectronic devices. In the present study, the critical micelle concentration (CMC) of CTAB surfactant obtained was equal to $9 \times 10^{-4}$ M. Nickel oxide nanoparticles was successfully prepared without and with CTAB surfactant by sol-gel method. Based on characterization techniques, the effect of different concentrations of cationic surfactant (cetyltrimethylammonium bromide, CTAB) on NiO nanoparticle properties were studied. Fourier transforms infrared spectroscopy (FTIR) showed a wide band at 430-530 cm$^{-1}$ corresponding to the Ni-O asymmetric vibration. The resulting nickel oxide particles were highly crystalline within the range of 19.3–23.0 nm as calculated using Scherrer equation. Below (CMC) gave the smallest particle size. Moreover, X-ray diffraction (XRD) pattern showed a face centered cubic (FCC) structure. The optical properties were studied using UV-Vis-NIR scanning spectrophotometer, which shows the band gap energy of prepared NiO samples decreased with increasing CTAB concentration, indicating the increase in the conductivity. The result showed that at lower (CMC), the NiO sample displayed uniform morphology and smaller particle size as shown by the FESEM analysis.
ABSTRAK