The formation of colloidal copper nanoparticles stabilized by zinc stearate: one-pot single-step synthesis and characterization of the core–shell particles†

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A highly efficient one-step process to generate Cu–Zn colloids was developed, in which the colloidal particles were synthesized from Cu and Zn stearates by reduction with H_2 in a continuously operated stirred tank reactor. The resulting spherical, well separated particles have a size of 5–10 nm, consisting of a crystalline Cu^0 core (fcc) stabilized by a Zn stearate shell without long-range order. *In situ* attenuated total reflection FTIR spectroscopy was used to monitor the shift of the C–O stretching vibration of adsorbed CO as a function of temperature and pressure. The absence of the CO rotation–vibration bands of dissolved CO allowed us to obtain FTIR spectra at a CO pressure of 1.0 MPa at 473 K resulting in three shifted CO bands at 2030–2025, 1979–1978, and 1920 cm^{-1}. These bands indicate the presence of reduced coadsorbed Zn species on the metallic Cu surface. Cyclic CO adsorption experiments demonstrated the dynamics of the interaction between the Cu core and the Zn stearate shell.