Supporting information:

**Figure S1.** SEM and EDX of Te products precipitated on the walls of glassware after 6 hour reaction.

SEM and corresponding EDX measurements demonstrate that the precipitates on the walls of reactor are Te nanorods. As proposed in the mechanism, the oxidation product of Te will nucleate and grow. Due to the intrinsic anisotropy, the growth speed along [001] inside Te crystals is faster than in other directions, and, therefore, Te nanorods form, aggregate, and finally precipitate on the walls of reactor.
The broad peak at 3360 cm\(^{-1}\) is attributed to –OH stretching vibration. The peak at 1620-1650 cm\(^{-1}\) is assigned to asymmetric C-O stretching vibration in carboxylic group. The peaks at 1410 cm\(^{-1}\) and 1340 cm\(^{-1}\) are attributed to symmetric C-O stretching vibration in carboxylic group.\(^1\) The weak absorption peaks at the finger-print region < 1300 cm\(^{-1}\) are complicated and may be assigned to CH-OH and C-N stretching vibration.\(^2\) Both peak shapes and peak positions in two spectra are almost same, especially for carboxylic and hydroxyl groups, which have the possibility to be modified in the course of the particle transformation process. Hence, IR confirmed that there is no structural alternation of EDTA after the replacement reaction. Note that, in comparison to pure EDTA, there is about 23 cm\(^{-1}\) downshift for the peak of asymmetric C-O stretching vibration, whereas no change for the peak of symmetric C-O stretching vibration, in the spectrum of EDTA.
after the replacement reaction. This downshift should originate from the interaction between metal Cd\textsuperscript{2+} cations in NP solution and EDTA, which is consistent with previous reports.\textsuperscript{1}
The PLE spectrum shows a distinct peak at around 380 nm, which is a clear signature for CdS NPs.\textsuperscript{3}

**Figure S3.** PLE spectrum of NPs after transition reaction at 48 hours. The detection wavelength is 535 nm.
Reference List

