

† Electronic supplementary information (ESI)

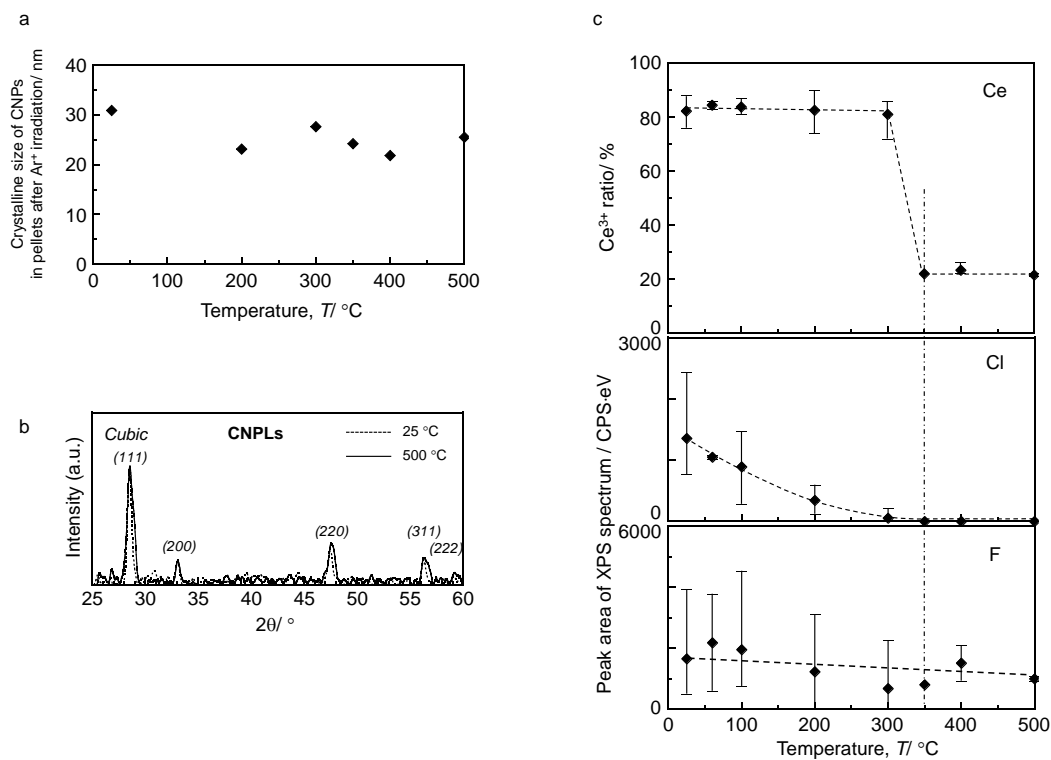


Fig. S1: Crystalline size of CNPs in the irradiated pellet samples after thermal oxidation at temperatures up to 500 °C (a). The crystalline size was calculated from XRD spectra (an incident angle of 0.5 °) using Scherrer equation. There is no change of the CNP size during thermal oxidation. XRD spectra of Ce³⁺-CNPLs before and after thermal exposure at 500 °C (b). The cubic crystal structure and composition of CNPLs did not change at temperatures up to 500 °C. The relationship between Ce³⁺ stability of CNPLs and extraneous elements, which came from the Ar⁺ irradiation chamber (c). Ce³⁺ stability in CNPLs was lost at 350 °C, but the existence of Cl and F on Ce³⁺-CNPLs did not affect Ce³⁺ stability.