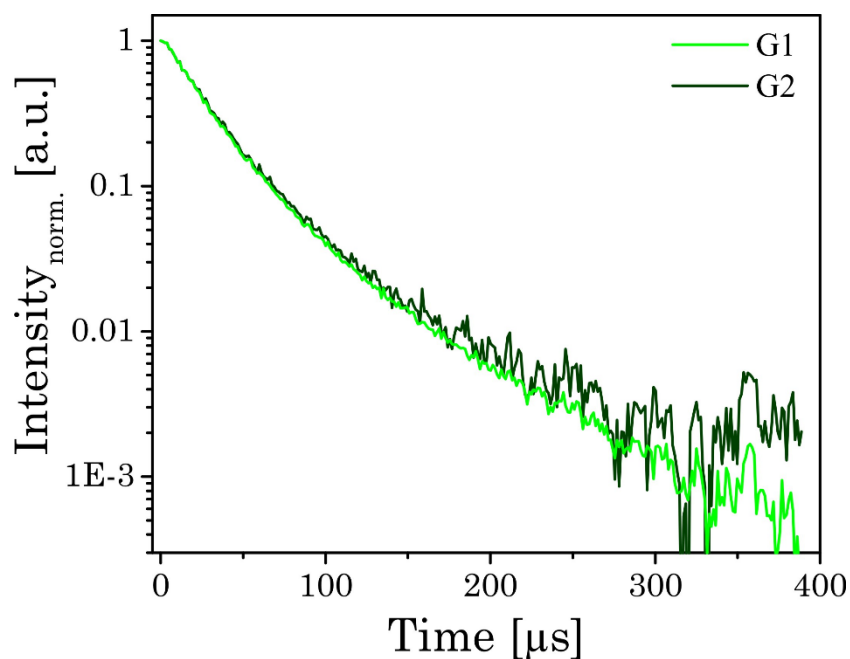


## Supporting Information:



SI.Fig.1: Normalized upconversion luminescence decay kinetics of the  $\text{Er}^{3+}$  emission bands G1 and G2 of  $\text{UCNP}_{400}$ .

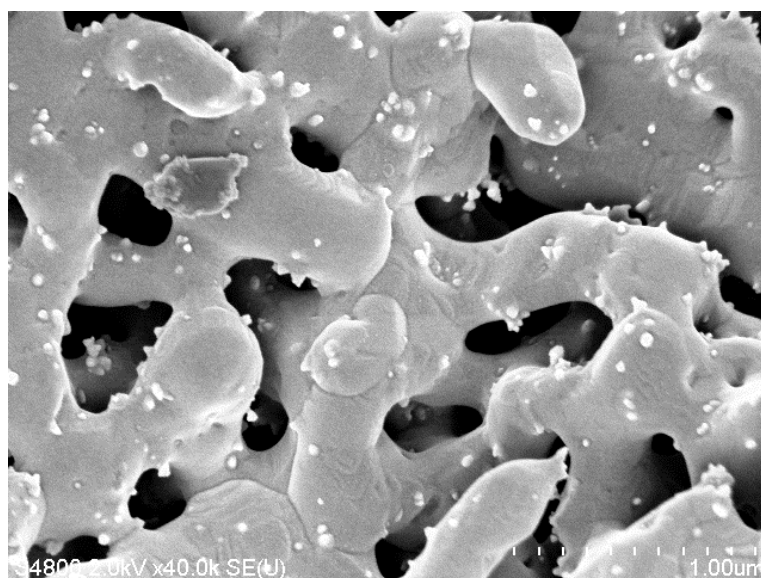


Fig.SI-2: SEM-image of annealed  $\text{UCNP}_{400}$  with micro domains, which is representative for all  $\text{UCNP}_x$  with  $x > 400^\circ\text{C}$ .

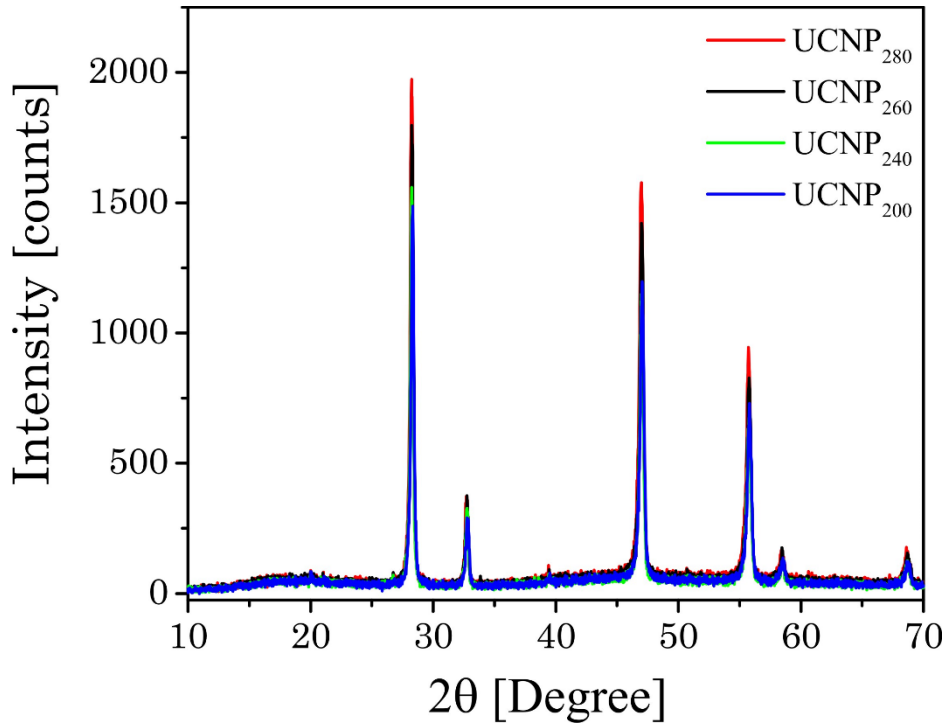


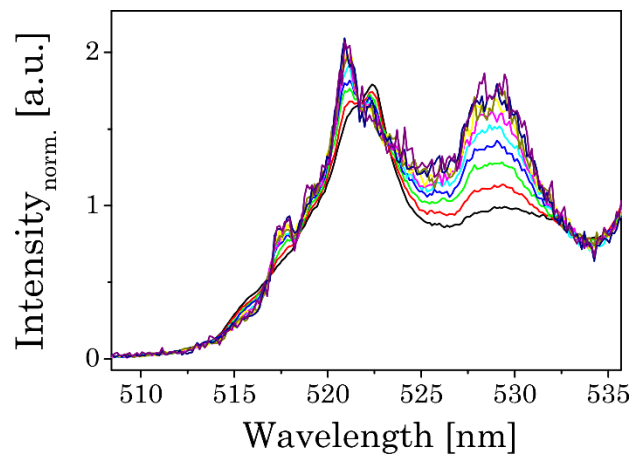
Fig. SI-3: X-ray diffraction patterns of UCNP<sub>x</sub> after annealing between 200°C < T<sub>an</sub> < 280°C for 5h.

SI-Tab.2: Crystallite size of UCNP<sub>x</sub> nanoparticles after different thermal treatment calculated with Debye-Scherrer from typical α-phase XRD pattern.

UCNP <sub>x</sub>	Millersche Indices			
	111	200	220	311
T <sub>an</sub> [°C]	Crystallite size [nm]			
200	36.8	38.2	27.7	26.2
220	38.7	39.7	28.9	26.1
240	38.9	43.1	29.0	26.3
280	39.6	39.9	28.6	25.8
300	39.6	39.6	29.2	25.5
700	47.7	48.6	34.1	25.2

SI-Tab.3: Crystallite size of UCNP<sub>x</sub> nanoparticles after different thermal treatment calculated with Debye-Scherrer from typical β-phase XRD pattern.

UCNP <sub>x</sub>	Millersche Indices				
	100	110	101	201	300
T <sub>an</sub> [°C]	Crystallite size [nm]				
400	64.4	59.8	58.2	46.4	41.3
500	95.1	75.4	73.6	58.1	53.4
600	105.3	78.7	69.6	53.6	53.0



*Fig. SI-4: Enlarged representation in G1-related TRANES for UCNP<sub>300</sub> showing the isoemissive points in detail.*