

ABBREVIATIONS

RE: Rare earths

UC: Upconversion

DTA: Differential thermal analysis

TGA: thermo-gravimetric analysis

FTIR: Fourier transforms infrared

XRD: X-ray diffraction

XPS: X-ray photon spectroscopy

SEM: Scanning electron microscopy

TEM: transmission electron microscopy

MPR : Multi-phonon relaxation

ESA: Excited state absorption

ET: Energy transfer

PA: Photon avalanche

FIR: Fluorescence intensity ratio

PV: Photovoltaic