Supporting Information

Bright white electroluminescence from polycrystalline dysprosium-doped yttrium gallium garnet nanofilms fabricated by atomic layer deposition on silicon

Zhimin Yu, Zejun Ye, Yang Yang, Jiaming Sun

School of Materials Science and Engineering, Tianjin Key Lab for Rare Earth Materials and Applications, Nankai University, Tianjin 300350, China

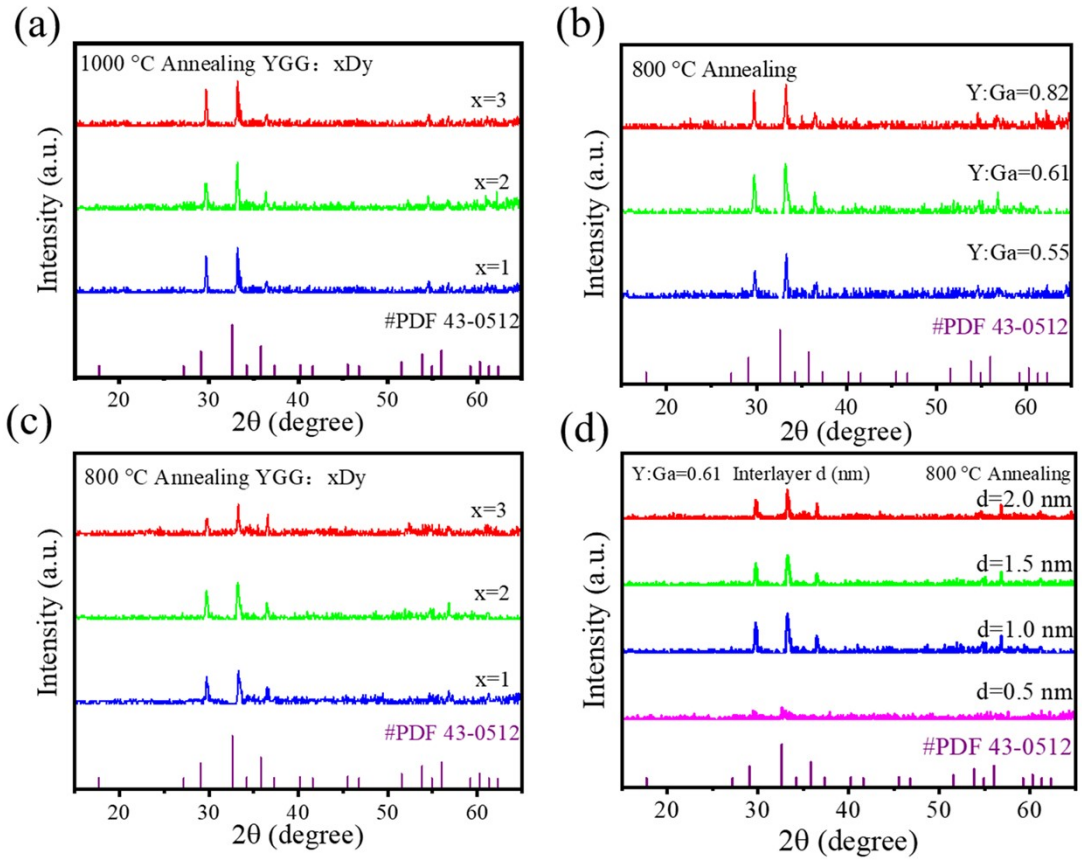

Fig. S1. XRD patterns of the Dy-doped $Y_3Ga_5O_{12}$ nanofilms, including (a) the 1000 °C-annealed nanofilms with different Dy_2O_3 dopant cycles, and the 800 °C-annealed nanofilms with different (b) Y/Ga ratios, (c) Dy_2O_3 dopant cycles and (d) Ga_2O_3 interlayer thicknesses.

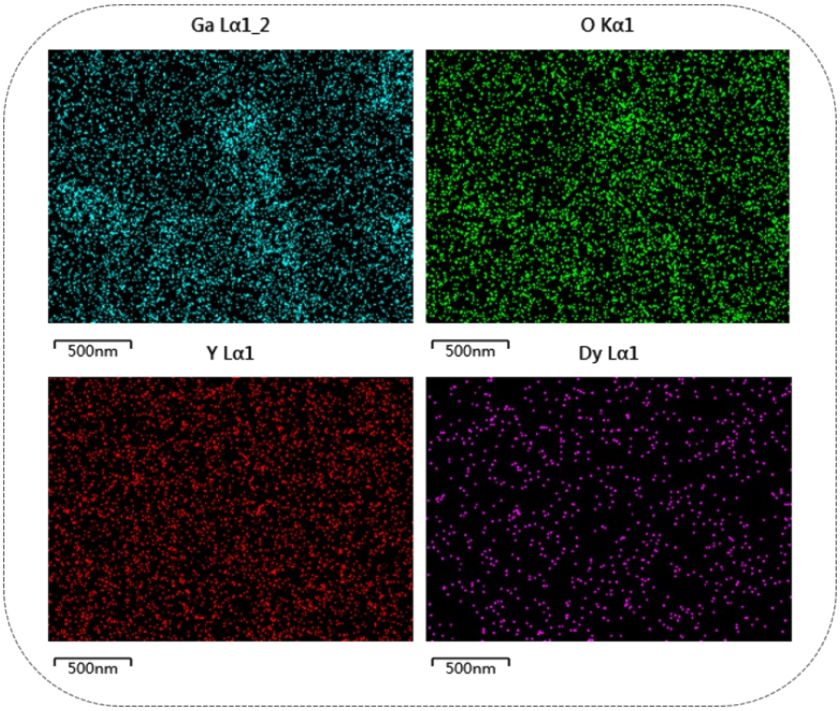

Fig. S2. EDS mapping of the 1000 °C annealed YGG:Dy (Y/Ga=0.61, 1.5 nm Ga_2O_3 interlayers) nanofilm.

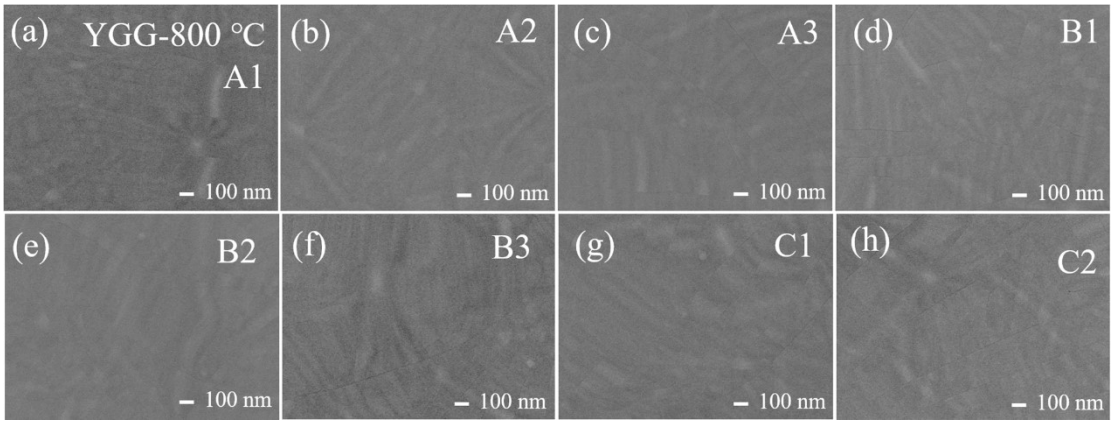

Fig. S3. SEM images of the YGG:Dy nanofilms annealed at 800 °C with different (a-c) Y/Ga ratios of 0.55, 0.61, 0.82, (d-f) Ga_2O_3 interlayer thicknesses of 0.5/1.5/2.0 nm, and (g, h) Dy_2O_3 dopant cycles of 1 and 3, respectively.

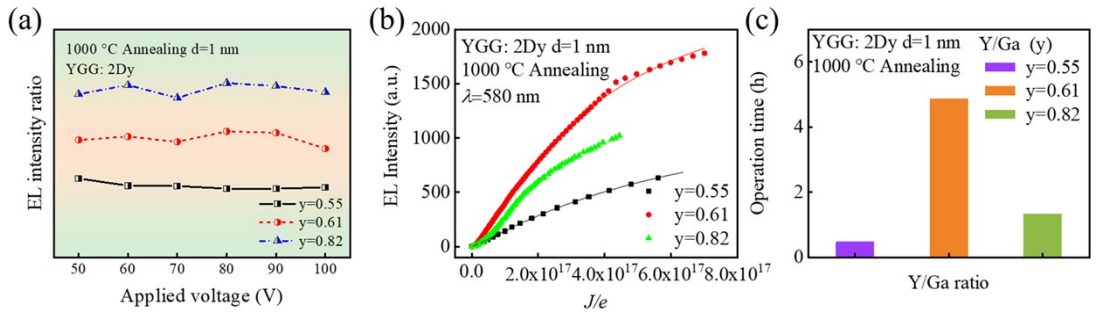

Fig. S4. (a) The EL intensity ratios of the 492 nm and 580 nm peaks from the devices based on the 1000 °C annealed YGG:Dy (1 nm Ga_2O_3 interlayers) nanofilms of different Y/Ga ratios. (b) The dependence of EL intensity on the injection carrier flux from the YGG:Dy MOSLEDs with different Y/Ga ratios, for the calculation of excitation cross-section. (c) The operation time of the YGG:Dy MOSLEDs with different Y/Ga ratios under the continuous current injection of 0.5 mA.

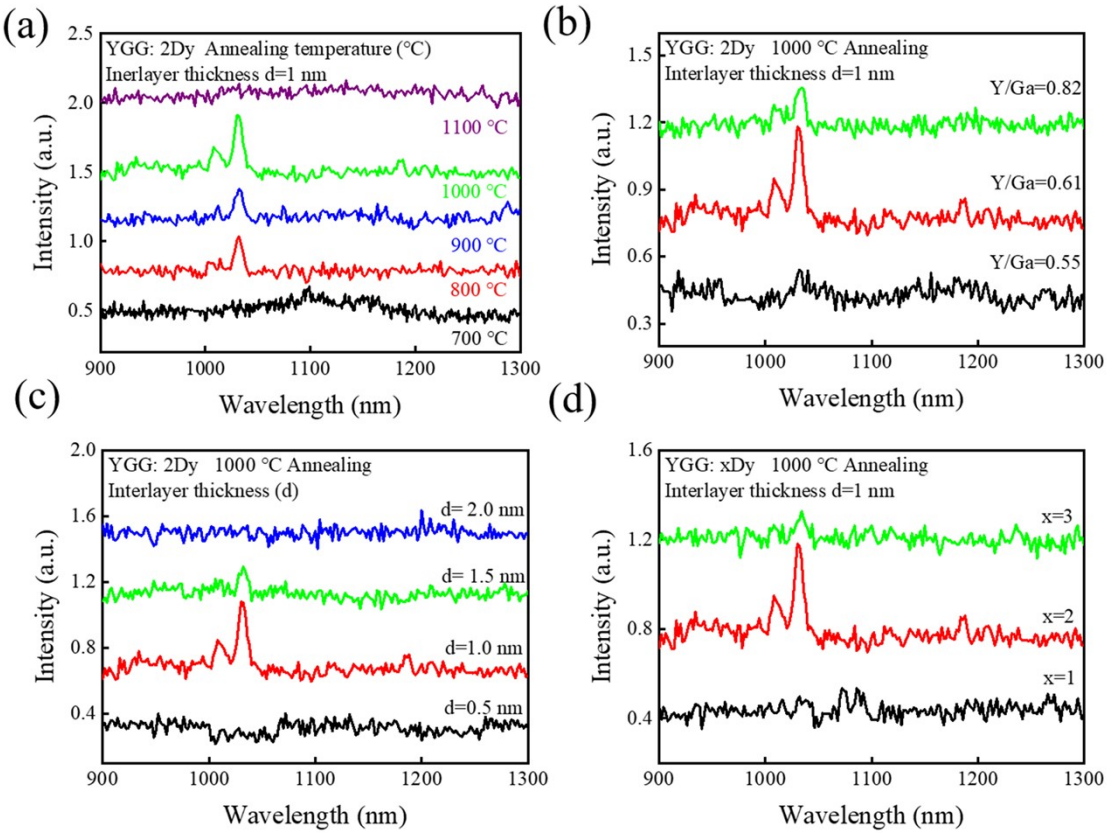

Fig. S5. The NIR EL spectra under the injection current of 0.5 mA from the YGG:Dy MOSLEDs with different fabrication parameters, including the (a) annealing temperatures, (b) Y/Ga ratios, (c) Ga_2O_3 interlayer thicknesses and (d) Dy_2O_3 dopant cycles.

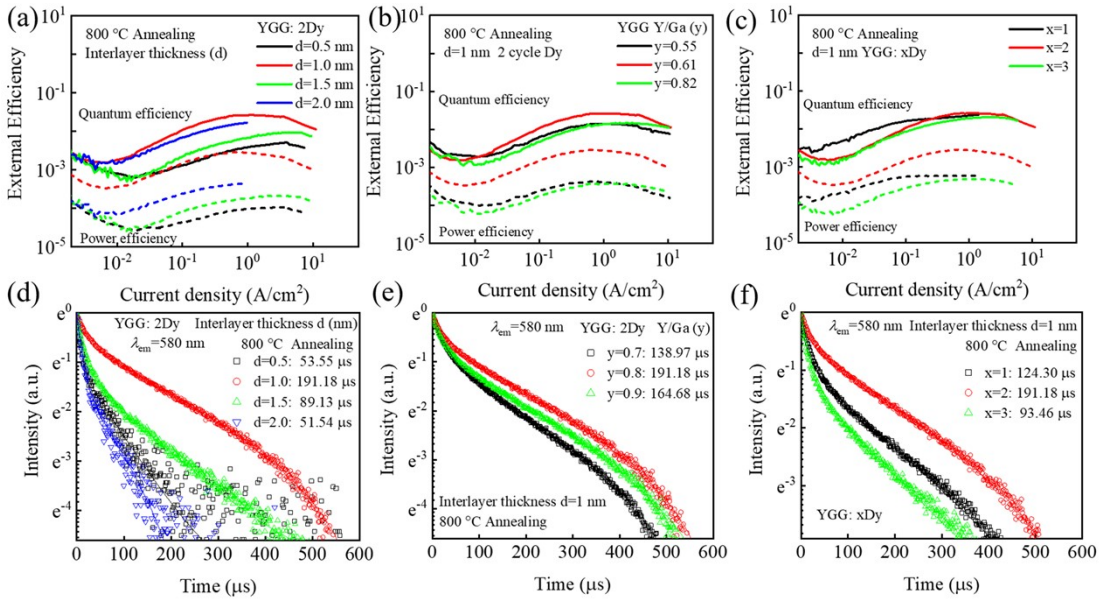

Fig. S6. (a-c) EQE and PE for the visible 580 nm emissions as a function of injection current for the MOSLEDs based on YGG:Dy nanofilms annealed at 800 °C, their EL decay traces are compared in (d-f).