Boosting broadband short-wave infrared emission to near-unity quantum efficiency via bridging Cr^{3+}-Ni^{2+} in spinel solid-solutions towards light-emitting diode applications

Geng Chen[1], Lifang Yuan[2,*], Chaoyue Peng[1], Haoyi Wu[1], Yahong Jin[1,*]

[1] School of Physics and Optoelectronic Engineering, Guangdong University of Technology, WaiHuan Xi Road, No. 100, Guangzhou 510006, China.

[2] School of Electronics and Communications, Guangdong Mechanical & Electrical Polytechnic, Guangzhou 510515, China.

Corresponding author:

E-mail: ylf121382@163.com (L. Y.), yhjin@gdut.edu.cn (Y. J.)

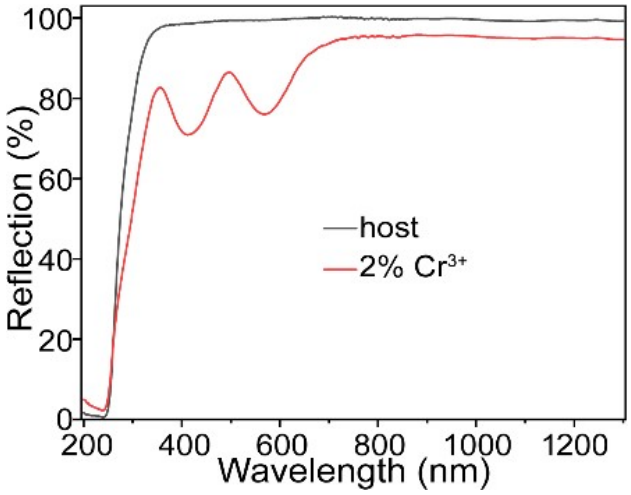

Fig. S1. DRS of $Mg_{0.5}Zn_{0.5}Ga_2O_4$ and $Mg_{0.5}Zn_{0.5}Ga_2O_4$:2% Cr^{3+}.

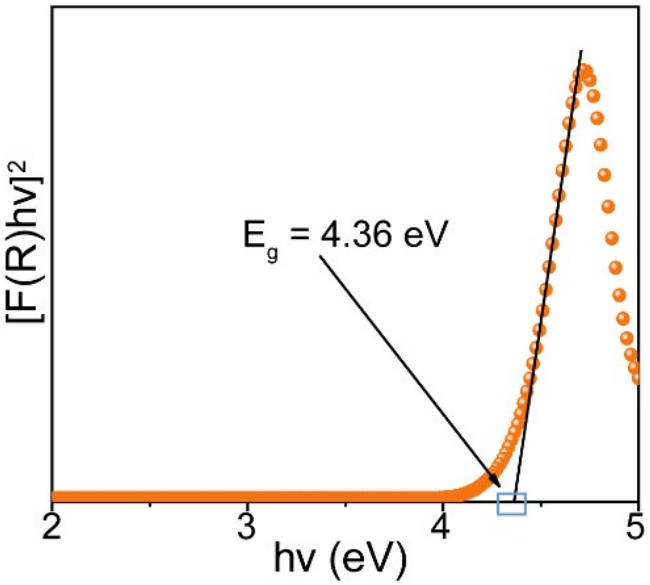

Fig. S2. Direct optical band gap of $Mg_{0.5}Zn_{0.5}Ga_2O_4$ host.

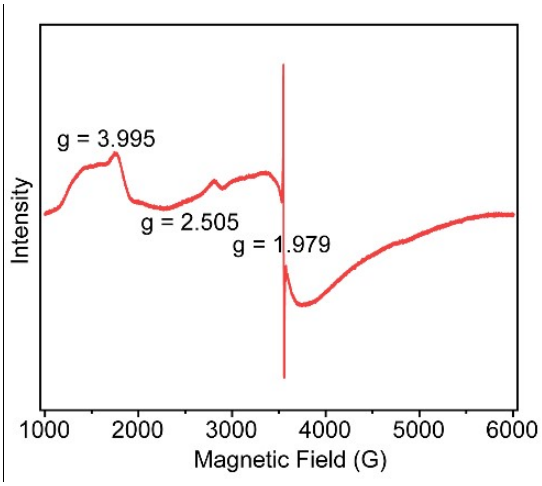

Fig. S3. EPR spectrum of $Mg_{0.5}Zn_{0.5}Ga_2O_4$:2%Cr^{3+}.

The signals in the EPR spectrum correspond to different types of Cr^{3+}. Specifically, g = 3.995 and g = 2.505 denote the isolated Cr^{3+} ions, while g = 1.979 signifies the presence of Cr^{3+}-Cr^{3+} ion pairs.

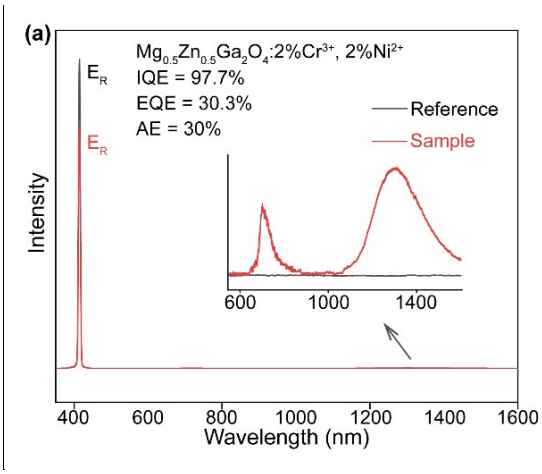

Fig. S4. Quantum efficiency measurement of $Mg_{0.5}Zn_{0.5}Ga_2O_4$:2% Cr^{3+}, 2% Ni^{2+}.