

Figure 1: Characterization of near Ni-Ga₂O₃ interfacial region using (a) CLS & (b) STEM. CLS reveals pronounced above bandgap emissions that correlate with a defective γ phase region observed in STEM.

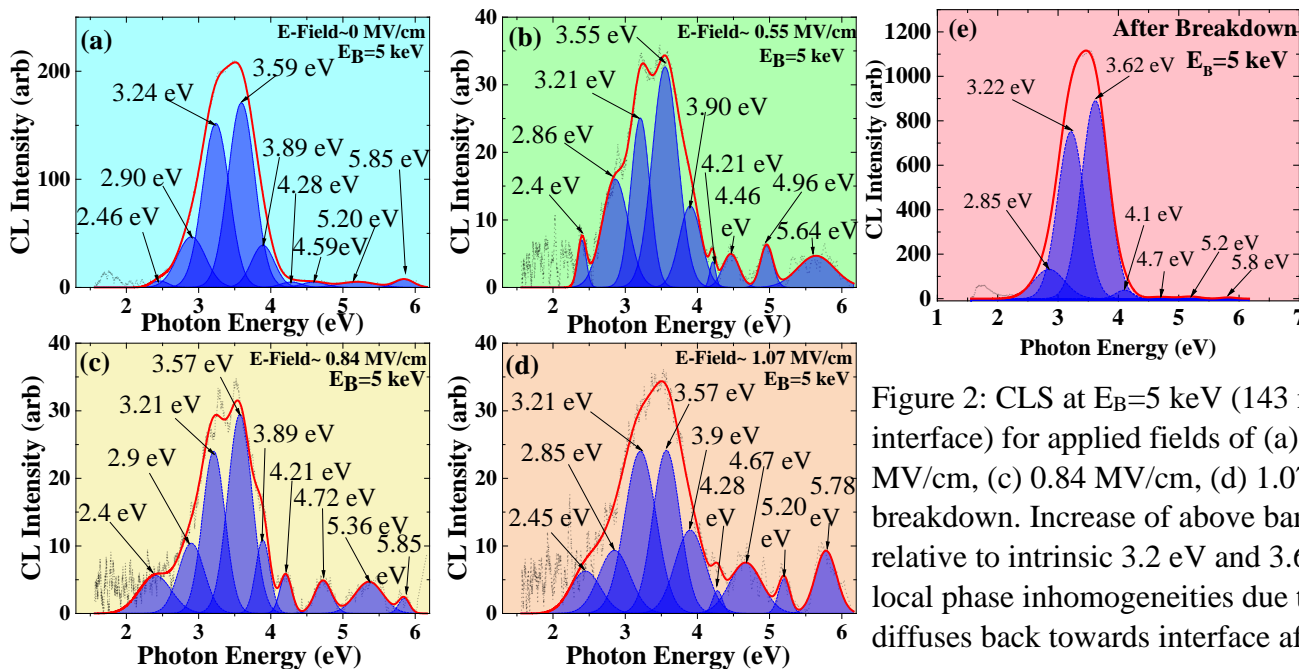


Figure 2: CLS at $E_B=5$ keV (143 nm below M-S interface) for applied fields of (a) 0 MV/cm, (b) 0.55 MV/cm, (c) 0.84 MV/cm, (d) 1.07 MV/cm & (e) after breakdown. Increase of above band gap emissions relative to intrinsic 3.2 eV and 3.6 eV emissions indicate local phase inhomogeneities due to Ni diffusion, which diffuses back towards interface after breakdown.

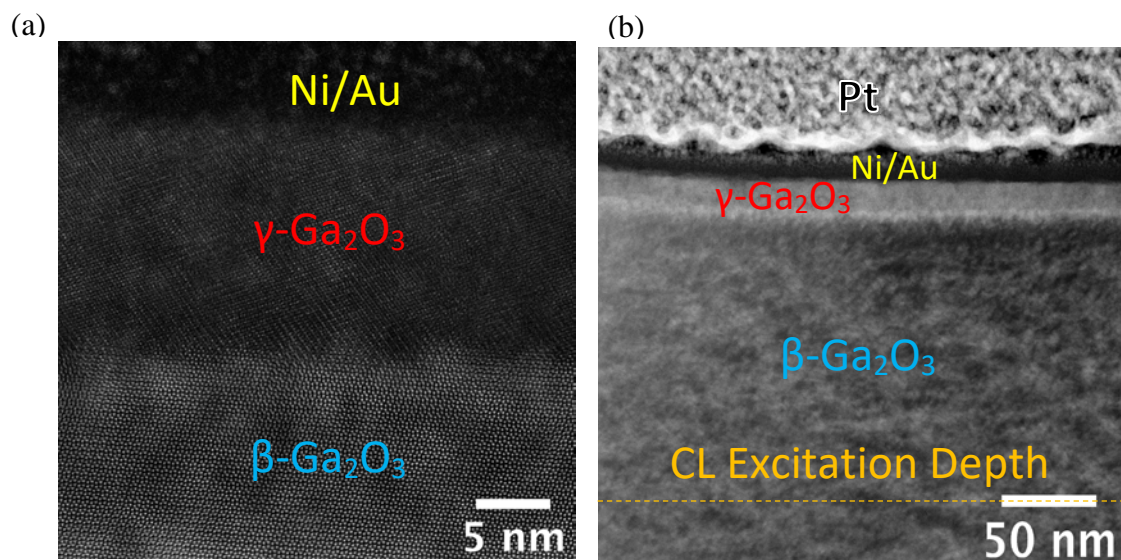


Figure 3: (a) HAADF image of near-interfacial region revealing that the γ phase became thicker after breakdown along with (b) LAADF image revealing that the phase 143 nm below M-S interface is homogenous after breakdown, indicating Ni diffusion back towards the Ni/Ga₂O₃ interface as breakdown