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Fig. S1, XRD pattern of (a)  $Ga_2O_3(UP-Ca(0))$  and (b)  $Ga_2O_3(UP-Ca(0.001))$ 



**(a)** 

**(b)** 

Fig. S2, SEM photographs of  $Ga_2O_3(UP-Ca(0))$  and  $Ga_2O_3(UP-Ca(0.001))$ 



Fig. S3, Energy-dispersive X-ray emission spectrum (EDS) of Ga<sub>2</sub>O<sub>3</sub> (UP-Ca(0.001))