

As you can see in the SEM images (Fig. 3(a)), the sample contains about 9 different emitting areas (I~IX) that could be utilized for the *in situ* measurement. So we would to give other experimental data for the field emission properties of J-E curves with gate modulation and detailed discussions.

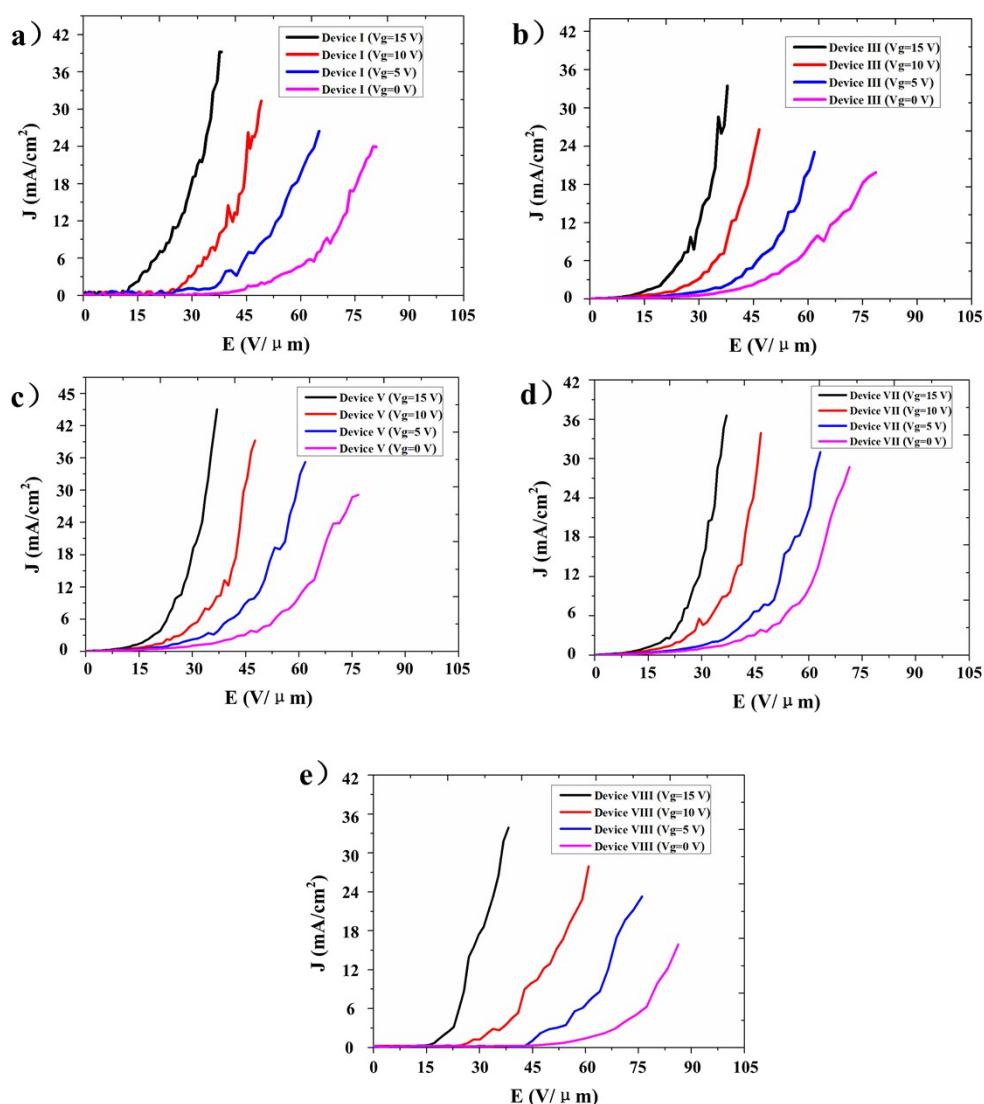


Fig. S1. Field emission of J-E curves for Device (a) I, (b) III, (c) V, (d) VII and (e) VIII with gate modulation.

From Fig. S1, it is clearly observed that the FLG/Au NPs nanocomposite shows a similar trend of field emission properties for 5 different emitting areas (the FE properties of Device IV was shown in the manuscript). We could clearly found that the FE performance is significantly enhanced by the decoration of Au NPs. The Au NPs decoration not only dramatically enhances the emission current densities but also decreases the turn-on field  $E_t$ .