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Robust micropatterning on graphene oxide based on fluorescence lifetime image for information storage

Abstract

Micropatterning of graphene oxide (GO) by direct laser reduction have been developed for various applications such as transparent electrodes, field effect transistor, and energy devices.[1-3] However the poor optical and fluorescence contrast limits its application in display and information storage. As shown in Figure 1(a), the nonouniform background in fluorescence intensity is mainly resulting from the inhomogeneous stacking of multilayer GO. Here we present a new type of micropatterning based on the fluorescence lifetime of GO, which is naturally robust against fluctuation in the stacking and fluorescence intensity. The micropatterning was performed by the reduction of GO using continue wave laser, and visualized by measuring the lifetime of GO and reduced GO (rGO) using picosecond laser. The lifetimes of GO and rGO are demonstrated by their chemical components and the degree of reduction, rather than the stacking layers or the fluorescence intensity.[4] The experimental results show that both the lifetimes of pristine GO and rGO have a narrow distribution, and they can be clearly distinguished, as shown in Figure 2. By measuring the lifetime of GO and rGO, micropatterns with high contrast can be successfully created, as shown in Figure 1(b), respectively. The robust micropatterning supports the potential applications in display and information storage.

References

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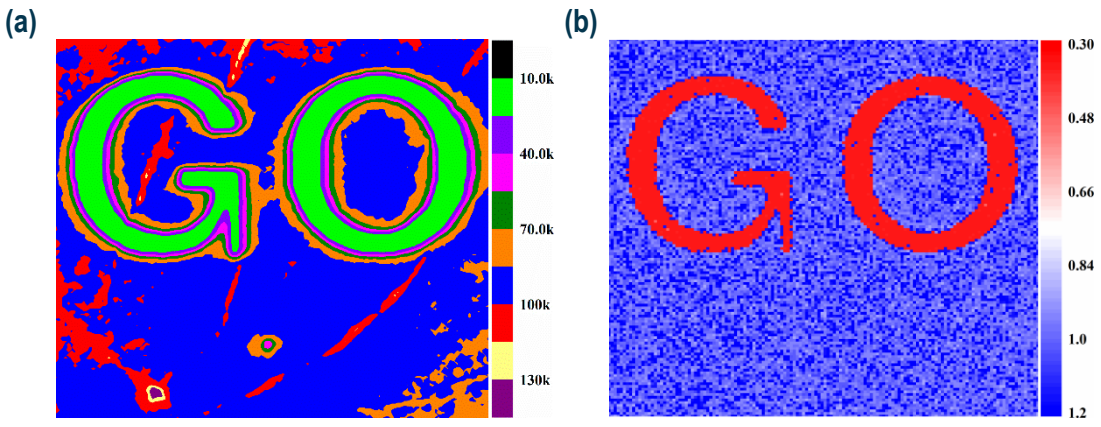

Figure 1: (a) Fluorescence image of "GO" pattern. The intensity of background performs strong inhomogeneous. (b) Lifetime image of "GO" pattern, which presents significant improved contrast.

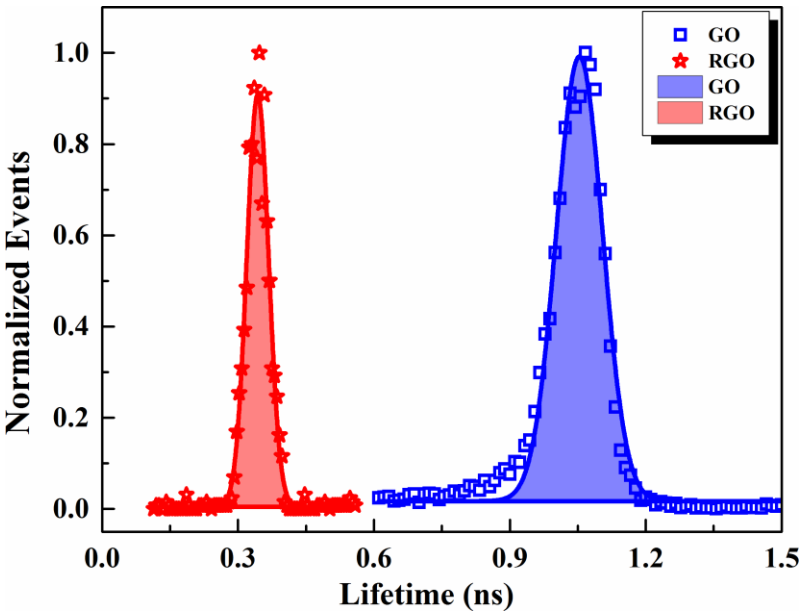

Figure 2: Lifetime distribution of GO and RGO, respectively.