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## Fast-response solar-blind ultraviolet photodetector with a graphene/ $\beta$ -Ga<sub>2</sub>O<sub>3</sub>/graphene hybrid structure

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### Abstract:

A high performance vertical solar-blind ultraviolet photodetector based on  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> thin films sandwiched between two graphene sheets has been fabricated by laser molecular beam epitaxy. The photodetector exhibits obvious rectifying characteristics and excellent solar-blind UV photoresponse. The fast rising and decay time of our detector are 0.96 s and 0.81 s under 254 nm illumination. The ratio of  $I_{254}/I_{\text{dark}}$  is up to 82.88 and the responsivity of graphene/ $\beta$ -Ga<sub>2</sub>O<sub>3</sub>/graphene photodetector increases to 9.66 A/W at 10 V bias. Our results suggest that this performance is attributed to the existence of Schottky barriers between  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> and two graphene sheets. The combination of Ga<sub>2</sub>O<sub>3</sub> and graphene might open up new possibilities for future UV integrated optoelectronic devices.

**Keywords:** Ga<sub>2</sub>O<sub>3</sub>, graphene, ultraviolet photodetector, laser molecular beam epitaxy technique

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