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Broadband Platinum Disulfide Based Saturable Absorber Used for Optical Fiber Mode Locking Lasers

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Abstract : Two dimensional (2D) materials have recently attained substantial research interest since the discovery of graphene. However, the zero-bandgap feature of the graphene limits its nonlinear optical applications, e.g., saturable absorption for these applications require strong light-matter interaction. Nevertheless, the excellent optoelectronic properties, such as broad tunable bandgap energy and high carrier mobility of Group 10 transition metal dichalcogenides 2D materials, e.g., PtS2 introduce new degree of freedoms in the optoelectronic applications. This work reports our recent research findings regarding the saturable absorption property of PtS2 layered 2D material and its possibility to be used as saturable absorber (SA) for ultrafast mode locking fiber laser. The demonstration of mode locking operation by using the fabricated PtS2 as SA will be discussed. The PtS2/PVA SA used in this experiment is made up of some few layered PtS2 nanosheets fabricated via a simple ultrasonic liquid exfoliation. The operational wavelength located at ~1 micron is demonstrated from Yb-doped mode locking fiber laser ring cavity by using the PtS2 SA. The fabricated PtS2 saturable absorber offers strong nonlinear properties, and it is capable of producing regular mode locking laser pulses with pulse to pulse duration matched with the round-trip cavity time. The results confirm successful mode locking operation achieved by the fabricated PtS2 material. This work opens some new opportunities for these PtS2 materials for the ultrafast laser generation. Acknowledgments: This work is financially supported by Shenzhen Science and Technology Innovation Commission (JCYJ20170303160136888) and the Research Grants Council of Hong Kong, China (GRF 152109/16E, PolyU code: B-Q52T).

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