

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).

Keywords : platinum disulfide, PtS₂, saturable absorption, saturable absorber, mode locking laser

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