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Mode-locked ytterbium-doped fiber laser using mechanically exfoliated black phosphorus as saturable absorber

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Abstract

We experimentally demonstrated a passive, stable mode-locked ytterbium-doped fiber laser (YDFL) based on black phosphorus (BP) as saturable absorber (SA). The BP-SA was prepared by mechanically exfoliation of the crystal and transferred the acquired thin layer onto the end surface of a standard FC/PC fiber connector. By incorporating the BP-SA into the YDFL cavity, a stable mode-locked operation was obtained at 1033.76 nm wavelength with a repetition rate of 10 MHz. The maximum pulse energy of 2.7 nJ and peak power of 0.83 kW were obtained at the maximum pump power of 200 mW. The experimental results indicate that the BP SA can be used successfully to generate stable mode-locking pulse at 1 μm region.

Keywords: Mode-locking; Black phosphorus; passive saturable absorber

1. Introduction

Recently, ultra-short optical pulse sources have attracted widespread interests because of their useful applications in many areas such as micromachining, communication, and optical systems

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