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# Bismuth Oxide Nanoflakes for Passive Q-Switching in a C-band Erbium Doped Fiber Laser

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## Abstract

In this work, bismuth oxide ( $\text{Bi}_2\text{O}_3$ ) nanoflakes suspended in a polyvinyl alcohol (PVA) host is used as a saturable absorber (SA) in an erbium-doped fiber laser (EDFL). The facile hydrothermal method is employed to synthesize the  $\text{Bi}_2\text{O}_3$  nanoflakes as the SA, which provides stable Q-switching at a central wavelength of 1564 nm with a maximum pulse energy of 21.31 nJ. The generated pulses have repetition rates of 28.41 kHz to 49.51 kHz and pulse widths of 4.9  $\mu\text{s}$  to 1.55  $\mu\text{s}$  over the available pump power range. The  $\text{Bi}_2\text{O}_3$ -PVA based SA also has a high signal-to-noise ratio (SNR) of 51.28 dB, indicating a significantly stable output and demonstrating the high potential of the fabricated  $\text{Bi}_2\text{O}_3$ -PVA film for practical applications. To the best of the author's knowledge, this is the first report of the use of a  $\text{Bi}_2\text{O}_3$ -PVA based SA for Q-switching in a C-band EDFL region.

**Keywords:** Bismuth oxide; Transition metal oxide; Saturable absorber; Passively Q-switched; Erbium doped fiber; C-band.

## Introduction

Recent advances in the development of fiber lasers have seen an increased focus towards the generation of Q-switched pulses with high pulse energies and long durations [1] that make them ideal for use in various applications such as material processing [2], remote sensing [3], range finding [4], and medicine [5]. In this regard, passively Q-switched

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