

Mechanically deposited tungsten disulfide saturable absorber for low-threshold Q-switched erbium-doped fiber laser

ABSTRACT

In this paper, we report a Q-switched erbium-doped fiber laser incorporating tungsten disulfide (WS₂) as the saturable absorber. A direct mechanical deposition technique using a scotch tape is employed to place the WS₂ powder onto the tip of a fiber ferrule. Several runs of mechanical extraction are performed to reduce the thickness of WS₂ powder on the fiber tip. The fabricated WS₂ saturable absorber exhibits a saturation intensity of 548.6 MW/cm², modulation depth of 4.1% and non-saturable loss of 67.8%. A ring cavity erbium-doped fiber laser integrating the WS₂ saturable absorber yields continuous wave lasing and Q-switching threshold at pump power of 10 and 12.7 mW, respectively. This Q-switching pump power threshold is the lowest to the best of the authors' knowledge. The proposed technique of direct mechanical deposition is inexpensive, significantly faster and simpler compared to previously reported methods.

Keyword: Tungsten disulfide; Saturable absorber; Q-switched; Erbium-doped fiber laser