

Low threshold Q-switched fiber laser incorporating titanium dioxide saturable absorber from waste material

ABSTRACT

We experimentally demonstrate a passively Q-switched erbium-doped fiber laser incorporating microfiber-based titanium dioxide (TiO₂) polymer composite saturable absorber. The anatase TiO₂ is derived from natural ilmenite waste via alkaline fusion method. The TiO₂ polymer composite is prepared using solvent exchange method and deposited onto tapered microfiber via dip coating technique. The passive Q-switching at 1558.3 nm with low threshold pump power of 16.4 mW, average output power of 1.0 mW and pulse energy of 47.6 nJ are realized. The shortest pulse width of 7 μs with 22.56 kHz repetition rate is recorded. This work opens up a new window for the generation of microsecond pulses using waste material.

Keyword: Titanium dioxide; Saturable absorber; Q-switched fiber laser; Ilmenite waste