1.56 mu m and 1.93 mu m synchronized mode-locked fiber laser with graphene saturable absorber

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Abstract

Ultrafast pulse with short duration ranging from picosecond to femtosecond has extensive industrial and scientific applications. The laser cavity generates this ultrafast pulse, however, was typically designed to emit the light at wavebands such as at approximately 1.5-1.6 mu m or 1.9-2.0 mu m. This could be limited by the bandgap of certain saturable absorber material to conduct ultra-broadband laser emission. Graphene, a 2D material with gapless band structure contributes to the optical resonant excitation to emit at any wavelength. The graphene was employed as the saturable absorber and positioned in a laser cavity consisting of both erbium and thulium-doped fiber laser. A synchronized mode-locked fiber laser was generated at a centre wavelength of 1563.5 nm and 1931.9 nm, giving a pulse duration of 700 fs and 1.77 ps at a constant pulse repetition rate of 12.905 MHz. The success of this work will provide a better insight by developing the optimum utilization of a saturable absorber in generating multiple mode-locked lasers with different yet far wavelength in near-infrared red region.

Keywords

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KeyWords Plus: ERBIUM

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