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Title: New octagonal shape double-clad Thulium-Ytterbium Co-doped fiber for generation of multi-wavelength and Q-switched lasers in 2 micron region

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Abstract: We demonstrate a simple, compact and low cost multi-wavelength and Q-switched fiber lasers based on newly developed octagonal shape double-clad Thulium-Ytterbium co-doped fiber (TYDF). The fiber is fabricated using the modified chemical vapor deposition (MCVD) process in conjunction with the solution doping technique. At 5 m long of TYDF, the laser produces three lines at 1914.5 nm, 1934.7 nm and 1953.6 nm with peak powers of 6.3 dBm, -1.6 dBm and 1.7 dBm, respectively due to the nonlinear polarization rotation effect in the laser ring cavity. The Q-switched TYDF laser operating at 1983.4 nm is also successfully demonstrated by exploiting a multi-walled carbon nanotubes (MWCNTs) polymer composite based saturable absorber. The composite is prepared by mixing the MWCNTs homogeneous solution into a dilute polyvinyl alcohol polymer solution before it is left to dry at room temperature to produce thin film. Then the film is sandwiched between two FC/PC fiber connectors and integrated into the laser cavity for Q-switching pulse generation. By varying the 905 nm multimode pump power from 1570 to 1606 mW, the pulse repetition rate increases from 27.4 to 37.8 kHz and the pulse width fluctuates within 4.9 μs to 3.8 μs. The maximum pulse energy of 10.6 nJ is obtained at pump power of 1570 mW.

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