

## **Graphene-chitin bio-composite polymer based mode locker at 2 micron region**

### **ABSTRACT**

In the field of pulsed fiber laser, graphene is a well-known two-dimensional (2D) material for its excellent optical properties. An alternative approach to the existing method, graphene based filament originally intended for 3-dimensional (3D) printing was used as starting material. Coupled with a newly introduced chitin nanofiber as the host polymer, it was demonstrated and reported as passive mode locker at 2-micron region. The conventional soliton operated at operating wavelength of 1982.7 nm with repetition rate of 11.35 MHz. The produced average output power, pulse width, time-bandwidth product (TBP) and signal to noise ratio (SNR) was 76.83  $\mu$ W, 1.88 ps (HAC200), 0.416 and 43 dB, respectively. When the pulse was amplified with 5.4 dB of Thulium doped fiber amplifier (TDFA), the average output power increased to 3.43 mW and produced a broad operating wavelength around the 2-micron region. At the same repetition rate of 11.35 MHz, the measured pulse width, SNR, pulse energy and peak power of 7.033 ps (pulseCheck 150), 42.0 dB, 0.30 nJ, and 42.98 W, are obtained, respectively. High power laser operation in this region can find applications in medical field and sensors technology.

**Keyword:** Graphene; Chitin; Mode-locker; Thulium doped fiber