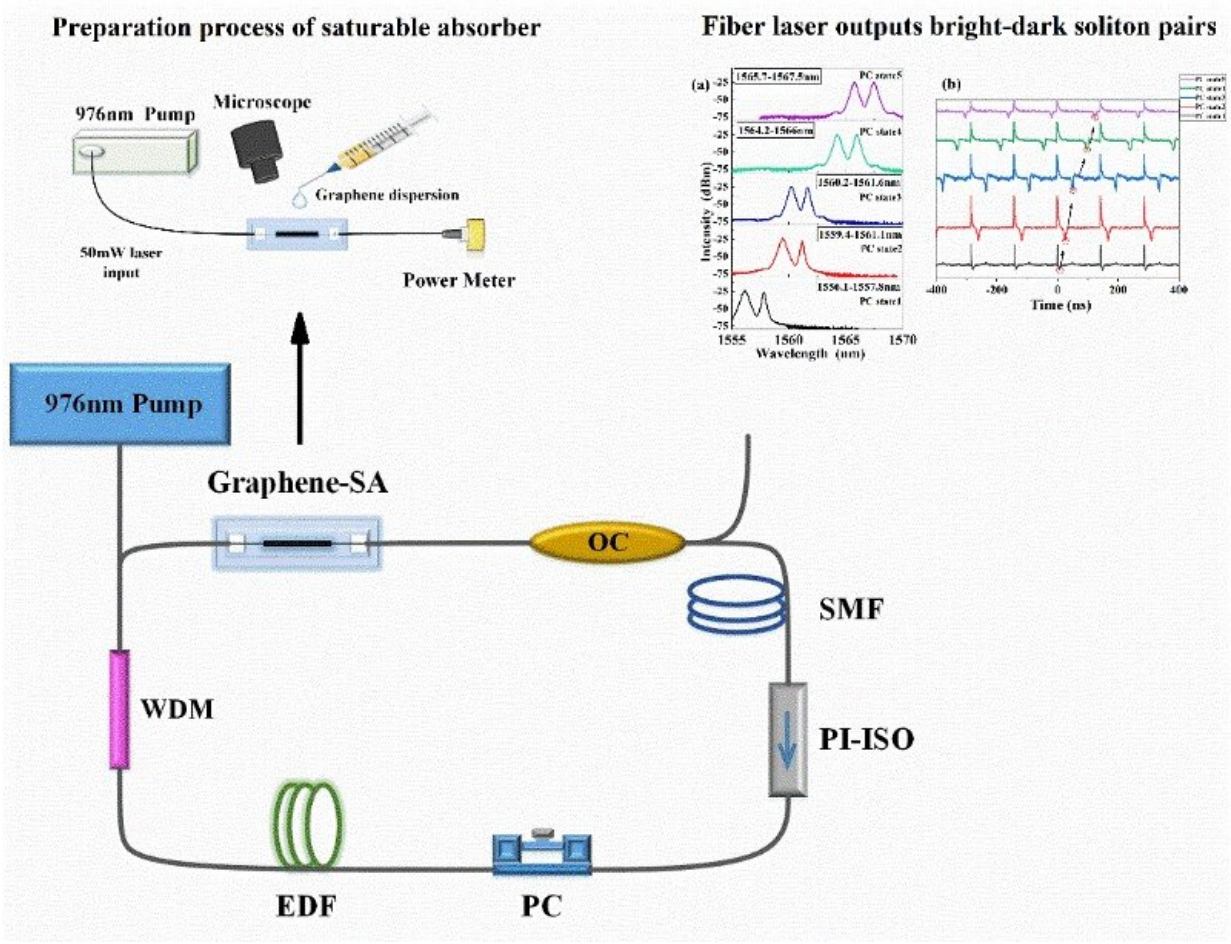
When graphene serves as a saturable absorber, it can generate two types of mode-locking states

July 4 2023



Structure of graphene mode-locked fiber laser and output of bright-dark soliton pairs. Credit: *Frontiers of Optoelectronics* (2023). DOI: 10.1007/s12200-023-00067-2

Passive mode-locked technology utilizes saturable absorbers' nonlinear absorption effect to regulate the cavity's loss and phase to generate mode-locked pulses. Graphene has a unique energy bandgap structure, a low absorption coefficient, a considerable modulation depth, and an ultrawide operating spectral range (300–2,500 nm).

Graphene has become an ideal saturable absorber in the Ultrashort pulse output of fiber lasers. Researchers have succeeded in many graphene mode-locked technology experiments to achieve mode-locked pulses. Various bright pulses have been reported, and laser pulses can also be divided into bright and dark pulses based on energy distribution patterns.

Researchers led by Prof. Mingyu Li at Changchun University of Science and Technology (CUST), China, are interested in graphene mode-locked fiber laser. Their idea is to prepare a graphene microfiber composite structure through the optical deposition method, which achieves an all-fiber structure and solves the problem of the low modulation depth of saturable absorbers.

The paper, "Generation of mode-locked states of conventional solitons and bright-dark solitons in graphene mode-locked fiber laser," has been published in *Frontiers of Optoelectronics*.

In this way, a graphene mode-locked fiber laser was constructed in the negative dispersion region, and the output characteristics of two switchable mode-locked pulses in the graphene mode-locked fiber laser, the effects of pump power and polarization state on bright dark soliton pairs, and dual-wavelength tunable characteristics were studied. This study will further expand the application of graphene in fiber lasers.

More information: Zixiong Li et al, Generation of mode-locked states of conventional solitons and bright-dark solitons in graphene mode-locked fiber laser, *Frontiers of Optoelectronics* (2023). DOI:

10.1007/s12200-023-00067-2