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A Passively Mode-Locked Erbium-Doped Fiber Laser Based on a Single-Wall Carbon Nanotube Polymer

F. Ahmad^{1,2}, S. W. Harun^{1,3}, R. M. Nor⁴, N. R. Zulkepely⁴, H. Ahmad³ and P. Shum⁵

Show affiliations

swharun@um.edu.my

¹ Department of Electrical Engineering, Faculty of Engineering, University of Malaya, 50603, Kuala Lumpur, Malaysia

² Department of Electrical Engineering, Universiti Teknologi Malaysia, Kuala Lumpur 54100, Malaysia

³ Photonics Research Centre, University of Malaya, Kuala Lumpur 50603, Malaysia

⁴ Department of Physics, University of Malaya, Kuala Lumpur 50603, Malaysia

⁵ OPTIMUS, School of Electrical and Electronics Engineering, Nanyang Technological University, Singapore 639798, Singapore

Abstract

We demonstrate a simple, compact and low-cost mode-locked erbium-doped fiber laser (EDFL) using a single-wall carbon nanotube (SWCNT) poly-ethylene oxide (PEO) composite as a passive saturable absorber (SA). The composite with an SWCNT concentration of 18wt% is prepared by mixing the SWCNT homogeneous solution with a diluted PEO polymer solution. A droplet of the polymer composite is applied on the fiber ferrule end, which is then mated to another clean ferrule connector to construct an SA. The SA is then integrated into the laser system to self-start stable mode locking at 1557 nm without employing a polarization controller. The EDFL generates a stable soliton pulse train with a duration of 0.81 ps, repetition rate of 44 MHz and average output power of 92.4 μ W at a 980 nm pump power of 26.8 mW. The soliton laser starts to lase at a pump power threshold of 14.6 mW.

PACS

42.55.Wd Fiber lasers

42.70.Jk Polymers and organics

42.65.Tg Optical solitons; nonlinear guided waves

42.60.Fc Modulation, tuning, and mode locking

42.65.Re Ultrafast processes; optical pulse generation and pulse compression

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