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Q-switching and mode-locking in highly doped Zr_2O_3 -Al₂O₃-Er₂O₃-doped fiber lasers using graphene as a saturable absorber (Article) [\(Open Access\)](#)

Ahmad, H.^a ✉, Thambiratnam, K.^a ✉, Muhammad, F.D.^a ✉, Zulkifli, M.Z.^a ✉, Zulkifli, A.Z.^a ✉, Paul, M.C.^b ✉, Harun, S.W.^a ✉

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Abstract

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The application of graphene as a saturable absorber (SA) for generating Q-switched and mode-locked pulses in a Zirconia-Erbium-doped fiber (Zr-EDF) laser is explored. Graphene-based SAs have a very wide operational range, which complements the extended operational bandwidth of the Zr-EDF. The Zr-EDF has an erbium concentration of about 4320 ppm, with absorption rates of 22.0 and 58.0 dB/m at 987 and 1550 nm. The system is capable of generating Q-switched pulses with pulsewidths and energies of 4.6 μs and 16.8 nJ, respectively, as well as peak powers of 3.6 mW at a repetition rate of 50.1 kHz. The Zr-EDF laser can also generate mode-locked pulses with pulsewidths, average output powers, pulse energies, and peak powers of 730 fs, 1.6 mW, 23.1 pJ, and 31.6 W, respectively, at a repetition rate of 69.3 MHz. Both the Q-switched and mode-locked output pulses are highly stable, allowing for their application in a multitude of real-world applications. © 2013 IEEE.

SciVal Topic Prominence

Topic: Saturable Absorbers | Erbium-Doped Fiber | Mode-locked Fiber Lasers

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Author keywords

Graphene-based saturable absorber mode-locking Q-switching Zirconia-Erbium-doped fiber (Zr-EDF)

Indexed keywords

Engineering uncontrolled terms

Erbium concentrations Mode-locked pulse Modelocking Operational bandwidth
Operational range Q-switched pulse Q-switching and mode-locking
Zirconia-Erbium-doped fiber (Zr-EDF)

Engineering controlled terms:

Fiber lasers Graphene Locks (fasteners) Mode-locked fiber lasers Q switched lasers
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Engineering main heading:

Pulse generators

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(2018) *IEEE Journal of Selected Topics in Quantum Electronics*

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(2013) *IEEE Photonics Journal*

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- 1 Clowes, J.
Next generation light sources for biomedical applications
(2008) *Opt. Photon*, 3, pp. 36-38. Cited 24 times.

- 2 Shah, L., Fermann, M.E.
High power femtosecond fiber chirped pulse amplification system for high speed micromachining
(2006) *Journal of Laser Micro Nanoengineering*, 1 (3), pp. 176-180. Cited 12 times.
<http://www.jlps.gr.jp/jlmn/upload/1a13b73a8a35d6041e8c3b56f389e85d.pdf>
doi: 10.2961/jlmn.2006.03.0005

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- 3 Ohta, H., Nogiwa, S., Oda, N., Chiba, H.
Highly sensitive optical sampling system using timing-jitter-reduced gain-switched optical pulse
(1997) *Electronics Letters*, 33 (25), pp. 2142-2144. Cited 24 times.
<http://scitation.aip.org/dbt/dbt.jsp?KEY=ELLEAK>
doi: 10.1049/el:19971470

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- 4 Schibli, T.R., Minoshima, K., Hong, F.-L., Inaba, H., Onae, A., Matsumoto, H., Hartl, I., (...), Fermann, M.E.
Frequency metrology with a turnkey all-fiber system
(2004) *Optics Letters*, 29 (21), pp. 2467-2469. Cited 198 times.
doi: 10.1364/OL.29.002467

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- 5 Seitz, W., Ell, R., Morgner, U., Schibli, T.R., Kärtner, F.X., Lederer, M.J., Braun, B.
All-optical active mode locking with a nonlinear semiconductor modulator
(2002) *Optics Letters*, 27 (24), pp. 2209-2211. Cited 7 times.
<http://ol.osa.org/Issue.cfm>
doi: 10.1364/OL.27.002209

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- 6 Kieu, K., Mansuripur, M.
Active Q switching of a fiber laser with a microsphere resonator
(2006) *Optics Letters*, 31 (24), pp. 3568-3570. Cited 27 times.
doi: 10.1364/OL.31.003568

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