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Editorial

Special Issue on Fiber Laser and Their Applications

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Fiber lasers have achieved significant advancements owing to their compactness, perfect beam quality, good environmental adaptability, and so on. The first optical fiber laser was proposed by Elias Snitzer, who suggested that optical fibers could be used as a gain medium for lasers. In the 1980s, significant progress was made in optical fiber technology, particularly in the development of high-purity optical fibers with low losses, which set the stage for the development of practical fiber lasers. Currently, fiber lasers are a mature technology with a wide range of applications in various industries, from manufacturing and medicine to telecommunications and scientific research. They continue to evolve, with ongoing research aimed at improving their performance and expanding their capabilities.

In this Special Issue, we highlight the recent progress in optical fibers, optical fiber devices, and fiber laser cavities, and their applications in the fields of micro/nanostructure fabrication, laser cleaning, and solar cells. Firstly, lasers at different emission wavelengths have been achieved. Danila et al. demonstrated a 976 nm Ytterbium-doped narrow-bandwidth randomly distributed feedback laser [1]. Lasers that are operated at 1.5 µm wavelength have been obtained via different methods, such as random laser cavity [2], distributed Bragg reflector laser cavity [3], passive mode locking based on a saturable absorber [4], Brillouin random lasing oscillation, and four-wave mixing [5]. A 2 µm laser was demonstrated by Guanqu et al. through the self-Q-switching technique [6]. Elena et al. numerically designed a 2.3 µm high-power optical amplifier based on a special multicore fiber [7]. In addition, some advanced fiber laser techniques have also been introduced, such as extending the locking range of the cavity modes in an actively mode-locked fiber ring laser through multiple optical injection signals [8], and a multi-wavelength random fiber laser with a high Raman gain efficiency and low Raman threshold gain medium [9]. She et al. designed an efficient circular polarization beam splitter based on a chiral dual-core photonic crystal fiber, which promotes the development of a highly stable fiber laser in the future [10].

Fiber laser systems are usually demanded to be applied in various fields. Junyuan et al. adopted a nanosecond pulsed laser to realize the preparation of a superhydrophobic nickel surface with more suitable friction and wear properties [11]. Yucui et al. demonstrated the morphology of grid lines deposited using the laser-induced forward transfer method [12]. Kun et al. investigated the technology and mechanism of cleaning an architectural aluminum formwork for concrete pouring with a high-energy and high repetition frequency pulsed laser source [13].

In summary, fiber lasers are more than just beams of light; they are the foundation of innovation across various sectors. As we conclude this Special Issue, we hope readers can gain a deeper appreciation of the transformative potential of fiber lasers. These remarkable

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technologies are not only shaping industries but are also enhancing our daily lives. The future illuminated by fiber lasers is brighter and more precise than ever before.

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References

1. Davydov, D.A.; Rybaltovsky, A.A.; Aleshkina, S.S.; Velmiskin, V.V.; Likhachev, M.E.; Popov, S.M.; Ryakhovskiy, D.V.; Chamorovskiy, Y.K.; Umnikov, A.A.; Lipatov, D.S. An Ytterbium-Doped Narrow-Bandwidth Randomly Distributed Feedback Laser Emitting at a Wavelength of 976 nm. *Photonics* **2023**, *10*, 951. [CrossRef]
2. Popov, S.; Rybaltovsky, A.; Bazakutsa, A.; Smirnov, A.; Ryakhovskiy, D.; Voloshin, V.; Kolosovskii, A.; Vorob'ev, I.; Isaev, V.; Chamorovskiy, Y.; et al. High Efficient Random Laser with Cavity Based on the Erbium-Doped Germanophosphosilicate Artificial Rayleigh Fiber. *Photonics* **2023**, *10*, 748. [CrossRef]
3. Skvortsov, M.I.; Proskurina, K.V.; Golikov, E.V.; Dostovalov, A.V.; Terentyev, V.S.; Egorova, O.N.; Semjonov, S.L.; Babin, S.A. Distributed Bragg Reflector Laser Based on Composite Fiber Heavily Doped with Erbium Ions. *Photonics* **2023**, *10*, 679. [CrossRef]
4. Guo, W.; Zhang, L.; Xiao, X.; Li, X.; Yin, Z.; Ning, H.; Zhang, X.; Zhang, X. Development of a Mode-Locked Fiber Laser Utilizing a Niobium Diselenide Saturable Absorber. *Photonics* **2023**, *10*, 610. [CrossRef]
5. Pang, Y.; Ma, S.; Ji, Q.; Zhao, X.; Li, Y.; Qin, Z.; Liu, Z.; Xu, Y. Frequency Comb Generation Based on Brillouin Random Lasing Oscillation and Four-Wave Mixing Assisted with Nonlinear Optical Loop Mirror. *Photonics* **2023**, *10*, 296. [CrossRef]
6. Hu, G.; Cui, J.; Tian, F.; Gao, Z.; Yan, S.; Liu, S.; Zhang, X.; Li, L. Orthogonally Polarized Dual-Wavelength Gain-Switched Ho:LuLiF4 Pulse Laser. *Photonics* **2023**, *10*, 62. [CrossRef]
7. Anashkina, E.A.; Andrianov, A.V.; Litvak, A.G. Numerical Simulation of High-Power Optical Amplifiers at 2.3 μm Based on a Special Multicore Fiber. *Photonics* **2023**, *10*, 711. [CrossRef]
8. Krishnamoorthy, S.; Prabhakar, A. Relocking and Locking Range Extension of Partially Locked AMLL Cavity Modes with Two Detuned RF Sinusoids. *Photonics* **2023**, *10*, 735. [CrossRef]
9. Hu, C.; Sun, P. 1.1–1.6 μm Multi-Wavelength Random Raman Fiber Laser. *Photonics* **2023**, *10*, 164. [CrossRef]
10. Li, S.; Li, Y.; Lv, H.; Ji, C.; Gao, H.; Sun, Q. Chiral Dual-Core Photonic Crystal Fiber for an Efficient Circular Polarization Beam Splitter. *Photonics* **2023**, *10*, 45. [CrossRef]
11. Huang, J.; Zhu, Z.; Zhang, L.; Guo, D.; Niu, Z.; Zhang, W. Effect of Contact Angle on Friction Properties of Superhydrophobic Nickel Surface. *Photonics* **2023**, *10*, 829. [CrossRef]
12. Yu, Y.; Zhang, Y.; Tian, C.; He, X.; Li, S.; Yu, G. Characterization of Grid Lines Formed by Laser-Induced Forward Transfer and Effect of Laser Fluence on the Silver Paste Transformation. *Photonics* **2023**, *10*, 717. [CrossRef]
13. Gao, K.; Xu, J.; Zhu, Y.; Zhang, Z.; Zeng, Q. Study on the Technology and Mechanism of Cleaning Architectural Aluminum Formwork for Concrete Pouring by High Energy and High Repetition Frequency Pulsed Laser. *Photonics* **2023**, *10*, 242. [CrossRef]