

Fiber lasers and their applications: introduction

WEI SHI,¹ AXEL SCHULZGEN,² RODRIGO AMEZCUA,² XIUSHAN ZHU,³ AND SHAI-UL ALAM⁴

¹Tianjin University, Tianjin 300072, China

²University of Central Florida, College of Optics Photonics, Orlando, Florida 32816, USA

³University of Arizona, College of Optical Sciences, Tucson, Arizona 85721, USA

⁴University of Southampton, Optoelectronic Research Center, Southampton, UK

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Fiber lasers have more and more applications in industrial, military, medical diagnosis, and scientific research. This issue features the progress in the area of fiber lasers, ranging from new developed gain materials to fiber laser systems and their applications. © 2017 Optical Society of America

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Over the past 50 years, fiber lasers have seen progressive development, which has promoted scientific and technological advances in a wide range of areas. The attractive characteristics of fiber lasers, including compactness, easy thermal management, reliable beam quality, low cost of maintenance, and so forth, facilitate their applications in telecommunications, environmental monitoring, medical diagnosis and treatment, material processing, and defense. The extensive research and development on fiber lasers, therefore, make a lasting impact on our daily life.

The performance improvement on fiber lasers with regard to the operating wavelength range, laser output power, temporal and spatial evolution, and practical integration with compact system design has been driven by the joint developments in fiber materials, laser system design, and applications. New host material glasses, such as fluoride, tellurite, and chalcogenide glasses, have been developed to extend the operating wavelength of fiber lasers from near infrared to mid-infrared. Nonlinear processes, such as four-wave

mixing, have been employed for harmonic generation in fiber systems, allowing for the achievement of wavelength inaccessible by conventional laser technology. On the other hand, the nonlinear effects, such as SBS and SRS, are still the dominant limitation toward high power fiber amplifiers, where different strategies have been proposed to break through the bottleneck. Intensive investigation on coherent beam combining provides substantial potential in brightness and power scaling. This feature issue focuses on some of the most recent advances in fiber lasers and their applications. The feature will bring together new achievements on fiber lasers, ranging from fiber material and structure design to fundamental principle exploration in fiber lasers to practical applications of fiber laser systems.

We hope this feature issue provides a reference for scientists, engineers, and practitioners who are interested in the cutting-edge progress on fiber lasers and their applications, and may push forward new developments and discoveries in this exciting field.