Special Issue

Advances in Nonlinear Fiber Optics: Science and Applications

Message from the Guest Editors

Since the first demonstration of a fiber laser by Charles J. Koester and E. Snitzer in 1964, various nonlinear optical phenomena in optical fibers, such as self-phase modulation, cross-phase modulation, four-wave mixing, stimulated Raman scattering, stimulated Brillouin scattering, and self-focusing, have been observed and studied. Ultrashort pulses, which are highly useful in microscopy, material processing, and telecommunications, can be generated and compressed within optical fibers. Fiber-based coherent anti-Stokes Raman scattering and stimulated Raman scattering microscopy rely on nonlinear interactions to achieve high-resolution, label-free imaging of biological tissues. Supercontinuum sources generated in optical fibers are used in spectroscopy, biomedical imaging, and metrology. High-efficiency wavelength conversion in optical fiber is crucial for laser sources and optical communications, while the generation of entangled photons enhances secure quantum communication. Nonlinear scattering in optical fibers is utilized for distributed temperature, strain, and chemical sensing in industrial and environmental monitoring.

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