Many efforts have been devoted to material and waveguide device developments to meet the demands of future photonics applications. There are still strong needs and interests to explore nonlinear fiber glass materials in order to develop various fiber devices including fiber lasers, optical parametric amplifiers, wavelength converters, slow light generation, supercontinuum (SC) generation, quantum effect devices, etc. Especially, SC generation has attracted the large interest in recent years due to its extensive applications such as frequency metrology, optical coherence tomography, pulse compression, microscopy and spectroscopy, telecommunication, and sensing. Silica fibers with engineered dispersion are currently used as major waveguide materials. However, they have two main limitations: low nonlinearity, and poor transmission range in mid-IR. Among non-silica glasses, such as tellurite, fluoride and chalcogenide glasses, are promising materials for photonics device applications, as they combine (i) a wide transmission window, (ii) good glass stability, (iii) high refractive index, (iv) increased nonlinear optical properties, and (v) relatively low phonon energies. However, the applications of high nonlinear soft glasses to photonics devices, especially nonlinear devices, have not always been successful up to now. One major issue would be the chromatic dispersion control. We have succeeded in chromatic dispersion engineering of those highly nonlinear soft glass fibers using new microstructured optical fiber structures, such as hybrid structure, and nanowire. In addition, we have successfully demonstrated the dynamic control of waveguide properties of soft glass microstructured optical fiber. Here we present a new prospect of highly nonlinear soft glass microstructured optical fibers for the applications, such as, SC generation, optical parametric amplification, harmonic generation, four wave mixing and so on.

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