FIBER RAMAN CW LASERS

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S u m m a r y

The review of theoretical and experimental results and the recent achievements in the field of cw fiber Raman lasers (FRL) based on stimulated Raman scattering (SRS) in single mode fibers is presented. The fiber Raman lasers, in particular the cw FRL of middle power, are the new class of laser sources, and their creation is recognized as one of the brightest achievements of laser physics of last time. Both approaches describing the modern level of the theory development and supplementing each other as quantum consideration and semiclassical approach are considered at the theoretical description of the Raman amplification in single mode fibers. Based on this theory, the quantitative methods of analysis of the Raman gain coefficient and the laser generation threshold in optical fibers are stated. The analysis of the experimental results on the SRS generation and light amplification in single mode fibers gives the enough full information about the basic experimental techniques of SRS observation, its physical principles, and features of their creation in optical fibers. The technological progress based on last achievements in fiber optics (highly effective SRS generation in the fiber, development of the double cladding fiber lasers, and fiber Bragg gratings technology) is the basis of the monolithic integration of fiber Raman lasers in the single mode fiber. The presented results of last FRL developments allow one to get imaginations about modern cw FRL schemas and its design methods and about key parameters which have been achieved at the practical device realizations. Since the fiber technology is essentially necessary for cw FRL design, the section devoted to technology achievements in Raman fibers and the next research directions on new active media creation allows us to estimate the circle of existing problems and to outline the mainstreams of FRL developments in the nearest next years. The actual material stated in the paper covers practically the full period of fiber optical Raman laser developments started from the fundamental researches executed in recently developed single mode fibers at the beginning of the 1970th, and up to the modern development described in the literature.