WHISPERING GALLERY MODE EMISSION FROM ALUMINOSILICATE MICROTUBE CAVITY

Y. P. Rakovich[1,2], K. I. Rusakov[1], A. A. Gladyshchuk[1], S. V. Chugunov[1], J. F. Donegan[2], S. Balakrishnan[2], Y. Gunko[2], T. Perova[2], A. Moore[2]

[1]Brest State Technical University, Brest, Belarus
[2]Trinity College Dublin, Dublin, Ireland

In recent years the studies of electromagnetic modes in solid three-dimensional microcavities have been of great interest both for their potential applications and fundamental optical properties. In this work we have studied the optical properties of a novel microtube cavity of ~ 7 – 8 μm diameter prepared by vacuum assisted filtration of aluminosilicate xerogel using micro-channel glass matrix followed by thermal treatment.

Periodic very narrow peaks of the emission spectra corresponding to orthogonally polarized whispering gallery modes were detected (Fig.1). The spectral position and linewidth of different modes were analysed using Lorenz-Mie theory. The mode assignments permit calculation of the spectral dependence of cavity Q values associated with observed peaks.

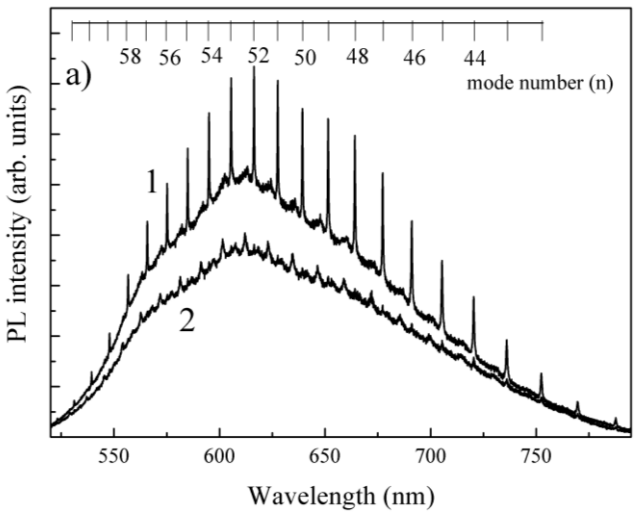

Fig. 1. Room-temperature micro-PL spectra of single free-standing microcavity with polarizer orientation parallel to the microtube axis (1) and polarizer rotated by 90^0 (2)

Well-defined excitation threshold was observed in the dependence of emission intensity on pump power. Intensity-dependent, time-resolved stimulated emission experiments were performed on the single microtube cavity. The results show a strong decrease in emission lifetime with increasing excitation intensity, consistent with a mechanism of amplified stimulated emission.