EFFECT OF RADIATION RESONANCES FOR TRANSVERSE MAGNETIC WAVE IN DIELECTRIC MICROSPHERES

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ABSTRACT. Effect of radiation resonances for Transverse Magnetic (TM) wave has been presented with comprehensive mathematical formulations. The present study are characterized both theoretically and experimentally by considering the fact that the size parameter (pi times diameter divided by wavelength of light) of the microspheres is very large at optical wavelengths. An asymptotic expression has been developed based on electromagnetic theory derivations at the large size parameter limits. The developed expressions for optical resonance condition of TM wave are very simple and can accurately characterize resonances in dielectric microspheres. The theoretical development is mathematically robust and significantly less complicated than existing approaches based on quantum physics presented in the literatures. The theoretical result of size parameter for consecutive morphology dependent resonance (MDR) peaks is validated by experimental data and the comparisons are shown to be very accurate for large size parameters. The quality factor of experimental resonance spectra observed in the laboratory is calculated approximately in the order of 10^4 which are sensitive enough to detect micro or nano level temperature changes in the surrounding medium.