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### Abstract

**Title:** *Bound Modes in Arrays of Spherical Particles*

Low-dimensional ordered arrays of dielectric particles can possess bound optical modes having an extremely high quality factor depending on the material used and the array geometry. We address the significant question whether such bound modes can be formed in dielectric systems where the absorption of light is negligible. Our investigation of circular and linear arrays of spherical particles within the framework of the multisphere Mie scattering theory shows that high quality modes in an array of 10 or more particles can be attained at least for a refractive index  $nr > 2$ ; the most bound modes have nearly transverse polarization perpendicular to the array plane; and in a particularly interesting case (TiO<sub>2</sub> particles,  $nr = 2.7$ ), the quality factor of the most bound mode increases almost by an order of magnitude with the addition of 10 extra particles, while for particles of GaAs the quality factor increases by almost two orders of magnitude. The error of the dipolar approach does not exceed few percents if  $nr > 2$ . Minimum acceptable disordering not affecting the quality factor is also investigated.

### Biography

**DR. BURIN** has been involved into theoretical investigation of optical phenomena in micro and nanosystems since the first experimental demonstration of mirror less microsize laser in 1999 by H. Cao group. At that time he was a research scientist in Northwestern University. In 2001 he suggested the original method of the analysis of optical modes based on the investigation of quasistates of light and applied this method to lasers (2001-2003) and later being to optical waveguides (2003-2007). Since 2003 Alexander Burin is working with the Chemistry Department of Tulane University and since 2005 the work of Alexander Burin in optical systems is supported by the Air Force Office of Scientific Research. Currently he has around 20 publications on the related topics.