新的光学共振效应，来自球形或圆柱形介观尺度粒子的截断处

DOI: 10.12086/oee.2023.231006.h03

球面谐振器由于违反了曲面上的全内反射，不能具有无限的 Q 因子。最近，很多研究都聚焦于使用连续体中的束缚态来提高球形介电谐振器的 Q 因子。

由托木斯克理工大学的 Igor V. Minin 和 Oleg V. Minin 教授，班戈大學的 Zengbo Wang 博士，以及莫斯科国立大学的 Boris Luk'yanchuk 教授组成的研究团队提出了一种基于介观尺度介电球体/圆柱体生成局域化深亚波长电磁场的新方法。被截断的球体或圆柱体可以被认为是介观尺度的 Janus 粒子。研究发现，在 Janus 粒子的散射近场中存在一种新颖的共振现象，该现象增强了近场的局部电场和磁场。现有研究表明，Janus 粒子的使用有助于提高品质因子，并增强接近 Janus 粒子的平坦 (切割) 面的其他表面粒子附近的电磁场强度分量。该效应与去除的物质部分的体积相关，并且可以在半径 R 约为 5λ~15λ 的尺寸范围内观察到。同时发现，在粒子平坦表面附近会出现亚波长级别的高度局域化的电磁场区域。这是电磁场深亚波长局域化的一种新机制。此外，使用平面波照射被截断的球体或圆柱体弯曲 (未截断) 的表面可生成耳语回廊模式 (WGM)。共振频率下切割粒子的厚度与著名的 Weierstrass SIL 标准不同。

Opto-Electronic Science, 2022, **1**(2): 210008.
https://www.oejournal.org/article/doi/10.29026/oes.2022.210008.

Cutoff of a spherical or cylindrical mesoscale particle leads to new optical resonant effect

DOI: 10.12086/oee.2023.231006.h03

It's well known that a spherical resonator cannot have an infinite Q factor due to the violation of the total internal reflection on a curved surface. Recently, many efforts have been made to increase the Q-factor of spherical and dielectric resonators using bound states in continuum.

The research groups of Profs. Igor V. Minin and Oleg V. Minin from Tomsk Polytechnic University, Dr. Zengbo Wang from the Bangor University and Prof. Boris S. Luk'yanchuk from Lomonosov Moscow State University propose a new method of the electromagnetic field deep subwavelength localization based on truncated mesoscale dielectric sphere or cylinder.

In this work, a novel resonant phenomenon arising in the scattered near field of Janus particles, which allows the near field enhancement of local electric and magnetic fields, was demonstrated. A truncated sphere or cylinder was considered as a Janus dielectric wavelength-scaled (mesoscale) particle. It has been shown that the use of Janus particles can contribute to an increase in the figure of merit and an increase in the electric and magnetic field intensity components near the flat (cutting) surface of the distant element of the particle. It is shown that essentially subwavelength highly localized regions of the electric and magnetic fields appear near the flat surface of the particle. It is a new mechanism of the electromagnetic field deep subwavelength localization.

Opto-Electronic Science, 2022, **1**(2): 210008.
https://www.oejournal.org/article/doi/10.29026/oes.2022.210008.