Challenge and Recent Progress Toward Practical Metamaterials

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Abstract

Metamaterials, artificially structured nanomaterials, have enabled unprecedented phenomena such as negative refraction. In this abstract, I will discuss recent progress in nanofabrication to overcome the limitation preventing the current metamaterials science from going to technology. The example includes, but not limited to, hierarchical fabrication techniques for three-dimensional metamaterial and plasmonic structures based on ultra-accurate and precise electron-beam lithography overlay. The examples include 3D bulk negative index metamaterials, chiral metamaterials in optical frequencies and so on. Also, the recent effort of bottom-up approach using nanoparticles and self-assembled materials for isotropic 3D metamaterials will be discussed as a new direction of nanofabrication. Such unique fabrication techniques will provide the opportunity to achieve true isotropic metamaterials and the bulk properties induced from the metamaterials.

Biography

Junsuk Rho is currently an assistant professor with a joint appointment in the Departments of Mechanical Engineering and Chemical Engineering at Pohang University of Science and Technology (POSTECH), Republic of Korea. Before joining POSTECH, he received a degree his B.S. (2007) and M.S. (2008) in Mechanical Engineering at Seoul National University, Korea and the University of Illinois, Urbana-Champaign, respectively. After getting Ph.D. (2013) in Mechanical Engineering and Nanoscale Science & Engineering from the University of California Berkeley, he had worked as a postdoctoral fellow in Materials Sciences Division at Lawrence Berkeley National Laboratory and Ugo Fano Fellow in Nanoscience and Technology Division at Argonne National Laboratory. His research is focused on developing novel nanophotonic materials and devices based on fundamental physics and experimental studies of deep sub-wavelength light-matter interaction. Dr. Rho has published approximately 10 high impact peer-reviewed journal papers including Science, Nature Photonics and Nature Communications. He has received honorable awards including Samsung Scholarship (2008-2013), the International Society for Optics and Photonics (SPIE) Scholarship (2011 & 2012), Materials Research Society (MRS) student award (2012), the Optical Society of America (OSA) Milton/Chang Award (2013), U.S. DOE Argonne Named Fellowship (2013-2016), Edmund Optics educational award (2015), the Optical Society of Korea young investigator award (2016), SPIE Rising Researcher Award (2017) and Korea Ministry of Science, ICT and Future Planning Minister’s Commendation (2017).