NCMN EQUATE
Emergent Quantum Materials and Technologies

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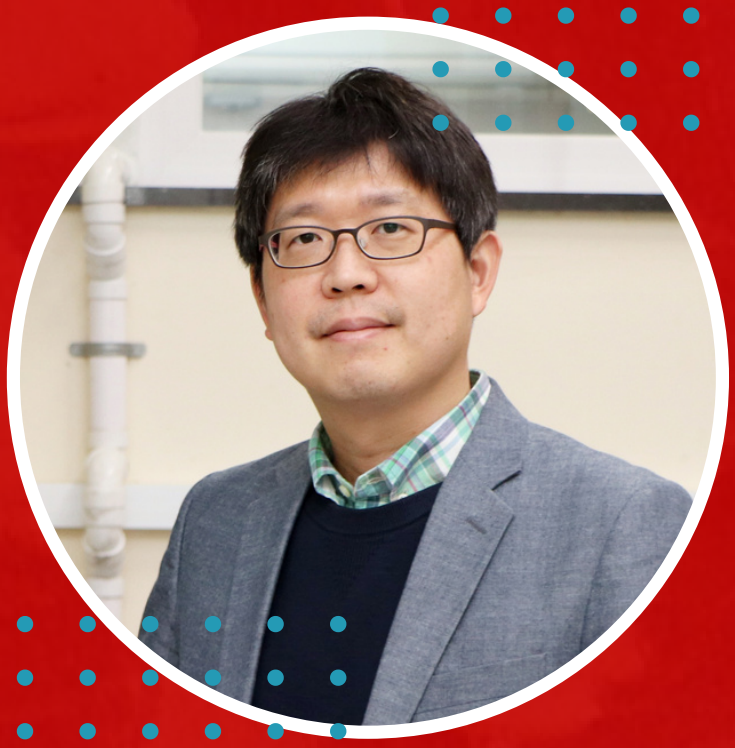

Metamaterials: from invisibility cloak to future extended reality displays

ABSTRACT

The invisibility cloak in Harry Potter and the dreams of invisibility as a superpower are no longer fiction. With the invention of metamaterials, they are theoretically and experimentally possible in real life. Metamaterials — materials that are engineered to have properties that are not found in naturally-occurring materials — allow us to overcome physical limitations. Scientists around the world are researching metamaterials that can be used in diverse sectors, including healthcare, optical display, and military affairs. For example, metalenses, which can exceed the physical limitations of light, may facilitate leaps in biology and chemistry. The development of metamaterials has just begun, but their potential is limitless. In this talk, I will give a brief overview of metamaterials and metasurfaces: principles, applications and manufacturing methods towards their science-to-technology transition.

BIO

Prof. Rho is a Mu-Eun-Jae (无垠斋) Endowed Chair Professor and Young Distinguished Professor at Pohang University of Science and Technology (POSTECH), Korea, with a double appointment in the Department of Chemical Engineering and the Department of Mechanical Engineering. He received his Ph.D. at the University of California, Berkeley (2013), M.S. at the University of Illinois, Urbana-Champaign (2008) and B.S. at Seoul National University, Korea (2007) all in Mechanical Engineering. Prior to joining POSTECH, he conducted postdoctoral research in Materials Sciences Division & Molecular Foundry at Lawrence Berkeley National Laboratory and also worked as a principal investigator (Ugo Fano Fellow) in Nanoscience and Technology Division & the Center for Nanoscale Materials at Argonne National Laboratory.

Prof. Rho's research group is not only developing a new concept of novel optical nanomaterials having extraordinary and unprecedented electromagnetic properties based on fundamental physics and experimental studies of deep sub-wavelength light-matter interaction, but also realizing engineering device applications including, but not limited to, super-resolution imaging, negative index materials, tunable/active/reconfigurable metasurfaces, highly efficient light controlling devices, ultra-sensitive biomedical sensors, nanoscale lasers, next-generation displays, VR/AR/XR devices, radiative cooling devices, unconventional nanofabrications, scalable nanomanufacturing methods and deep-learning-based design methodologies.

Prof. Rho has authored and co-authored more than 250 high-impact journal papers including Science, Nature, Nature Nanotechnology, Nature Materials, Nature Photonics and Chemical Reviews. He is also the recipient of several notable honors and awards such as Samsung Lee Kun-Hee fellowship (2008-2013), US Department of Energy Argonne Named fellowship (2013-2016), Edmund Optics Award (2015), SPIE Rising Researcher Award (2017), OSA IMCO Young Scientist Award (2019), Korean Presidential Early Career Award for Scientists and Engineers (2019), Springer-Nature MINE Young Scientist Award (2020), Elsevier MEE/MNE Young Investigator Award and Lectureship (2020), MDPI Micromachines Young Investigator Award (2020), Member of the Young Korean Academy of Science and Technology (2020), Associate Member of the National Academy of Engineering of Korea (2022), NAEK Young Engineers Award (2022), Hong Jin-Ki Creator Award (2022). He serves 13 editorial positions including Light: Science and Applications (Springer-Nature), Microsystems and Nanoengineering (Springer-Nature) and Nanophotonics (De Gruyter).

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