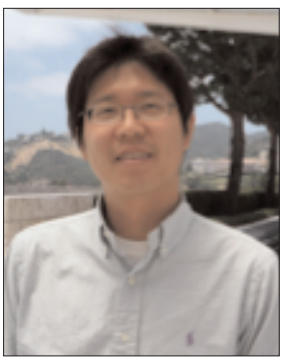
Nanoscale Photonics and Integrated Manufacturing

Jun Suk Rho



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 high refractive index metasurface, nanoscale laser and next generation scalable nanomanufacturing methods.

Prof. Rho has authored and co-authored high impact journal papers including Science, Nature Photonics and Nature Communications. His work has been introduced and widely covered by media such as IEEE Spectrum, LBL News, Science Daily, Physics World, Photonics Spectra, YTN News, Korea Times, Korea Economic Daily and Seoul Economic Daily. He is also the recipients of notable honors and awards in the field such as MRS student award, SPIE scholarship, Samsung Fellowship and DOE Argonne Named Fellowship.

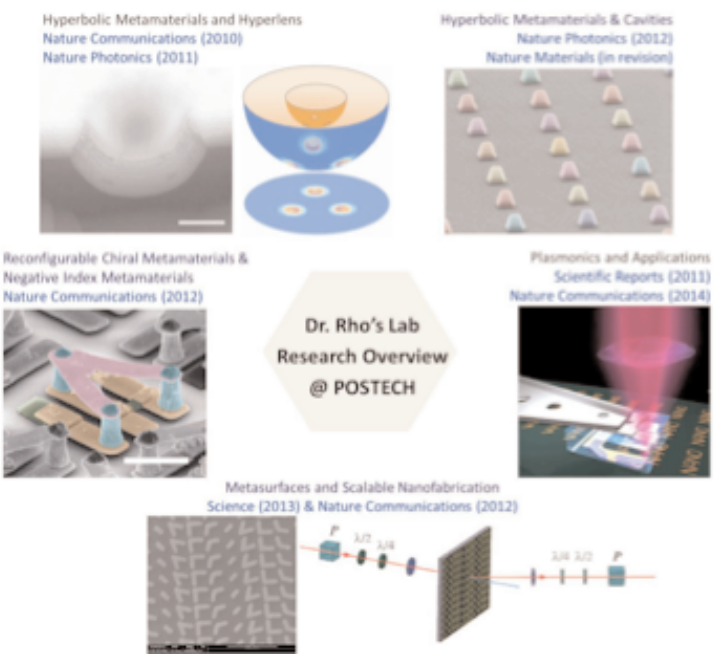
Specific area and research direction are as below:

Metamaterials Metamaterials, artificially structured nanomaterials, have enabled the extraordinary optical properties and unprecedented phenomena such as invisibility cloaking and negative refraction. We are designing and conducting experimental realization of novel negative index metamaterials, chiral metamaterials, hyperbolic metamaterials and metasurface working with low loss and broad bandwidth.

Plasmonics Due to plasmonic mode excitation of high-k vector access in dispersion relation, light can be confined to deep sub-wavelength. We are not only investigating the energy transportation mechanisms and applications at nanometer length scale, but also studying plasmon (electron)-polariton (phonon) interaction for non-linear properties of light.

Device Applications With the properties of unnaturally high wavevectors access, super-resolution hyperlens imaging beyond diffraction limit has been demonstrated from our group. Its extraordinary performances such as super-resolution, real-time and non-vacuum working environment open a new possibility for nanoscale biological imaging, which can be very practical. Such efforts to make more practical metadevices are being pursued.

Nanofabrication and Nanomanufacturing Along with novel nanofabrication method development, experimental demonstration and applications of scalable nanomanufacutring research is actively ongoing. It includes, but not limited to, hyperlens based 2D lithography and 3D printing (sub-50nm), flying head maskless flying head nanolithography (sub-22nm), single quantum dot patterning (sub-15nm) and nanocascade patterning (sub-10nm) and other unconventional nanofabrication/manufacturing approaches.



Education

Ph.D. 2013 University of California, Berkeley
M.S. 2008 University of Illinois, Urbana-Champaign
B.S. 2007 Seoul National University

Experience

2014 - Assistant Professor, POSTECH
2013 - 2014 Argonne Scholar - Ugo Fano Fellow Argonne National Laboratory
2013 - 2013 Postdoctoral Fellow Lawrence Berkeley National Laboratory
2009 - 2013 Affiliate Scientist Lawrence Berkeley National Laboratory

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Major Publications

- K. O'Brien and J Rho et al., "Predicting nonlinear properties of metamaterials from the linear response", Nature Materials 2014 (in press)
- K. O'Brien and J Rho et al., "Ultrafast acousto-plasmonic control and sensing in complex nanostructures", Nature Communications 5, 4042, 2014
- X. Yin and J. Rho et al., "Anomalous photonic spin-hall effect at metasurface", Science 339, 1405-1407, 2013
- S. Zhang and J. Rho et al., "Photo-induced handedness switching in terahertz chiral meta-molecules", Nature Communications 3, 942, 2012
- J. Rho et al., "Experimental realization of 3D indefinite cavities at the nanoscale with anomalous scaling law", Nature Photonics 6, 450-454, 2012