

Chirality-Related Applications of Helical Nanoparticles with Sub-10-nm Helical Pitches

Metallic helices with a characteristic helical pitch (P) in the micro- or nano-scale have been proposed for diverse chirality-related primary applications. However, limit development of nanofabrication techniques leads to $P > 20$ nm; molecules are too small in size to effectively perceive the helical chirality, and such the dimensional mismatch will substantially prohibit the development of those applications. In this talk, I will devise a method to tackle this fundamental problem, through using glancing angle deposition with fast substrate rotation to produce helical nanoparticles (HNPs) that have sub-10-nm P and are composed of controllable plasmonic materials and helicity. HNPs are used to induce enantiospecific adsorption of molecules, mediate the enantiopreferential photocyclodimerization of 2-anthracenecarboxylic acid, and markedly enhance optical activity of chiral molecules in roughly one order of magnitude. These studies will pave the way to developing HNPs for significant chirality-related applications, such as heterogeneous asymmetric catalysis and determining absolute configuration of chiral molecules with high sensitivity.

Biography:

Dr. Zhifeng Huang (黄陟峰) obtained B.Sc. in Chemistry (in 2000) and M.Sc. in Physical Chemistry (in 2003) at Xiamen University (China), and Ph.D. in Science and Engineering of Materials at Arizona State University (US, 2007). After working as a postdoctoral fellow in Department of Electrical and Computing Engineering at University of Alberta (Canada, Jan. 2008 – Aug. 2009), Dr. Huang joined Department of Physics at Hong Kong Baptist University (HKBU) as an Assistant Professor, and was promoted to Associate Professor in 2015.



Dr. Huang is devoted to fabricating sculptured nano thin films to study chiral nanoplasmonics, surface enhanced chiroptical spectroscopies, enantioselective synthesis, photochirogenesis, enantiodifferentiation, trace (bio)molecular detection, bio-nano

interaction, specific differentiation of stem cells, functional optic coating, and flexible/wearable energy generation and storage. He contributed to two book chapters, and published his studies in Nat. Nanotechnol., Annu. Rev. Phys. Chem., Adv. Mater., Nano Lett., J. Am. Chem. Soc., Small, Nanoscale, and so on.

Dr. Huang was presented Gold Medal with Congratulations of Jury (The 46th International Exhibition of Inventions of Geneva, 2018), Outstanding Research Achievement (APSMR, 2017 and 2018), the Prof. Rudolph A. Marcus Award 2016, the Incentive Award for Outstanding Research Achievement (Faculty of Science, HKBU, 2015), and National-level Technology Project Award for Advanced Individual (2012, 2014). He is serving as an Associate Editor for Science Advances Today and Science Letters Journal (Cognizure).