

Editorial

The Nano Research Young Innovators (NR45) Awards in nanomaterial self-assembly

Hua Kuang* and Zhihong Nie*

Nano Research, **2025**, 18, 94907678
<https://doi.org/10.26599/NR.2025.94907678>

Fabrication

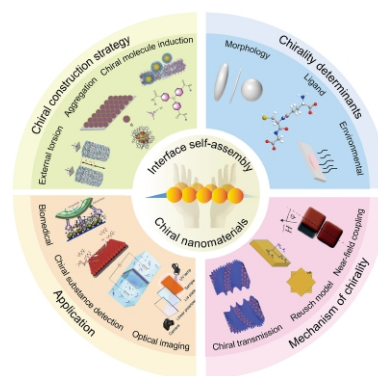
Review Articles

Interface-driven self-assembly: A robust strategy for chiral generation and amplification in inorganic nanomaterials

Wenhui Yan, Xinyu Wang, Dai-Wen Pang, and Jiarong Cai*

Nano Research, **2025**, 18, 94907158
<https://doi.org/10.26599/NR.2025.94907158>

This review examines interface-driven self-assembly strategies for generating and amplifying chiroptical properties in inorganic nanomaterials. It highlights key mechanisms, interfacial processes, and influencing factors, reviews theoretical models, and discusses applications in biosensing and photonics.

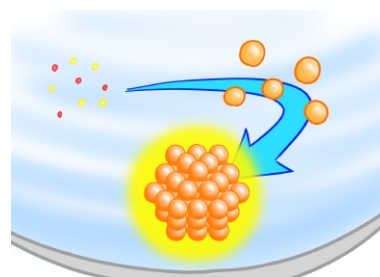


One-step preparation of three-dimensional superlattices during nanoparticle synthesis

Masaki Saruyama*, Nao Nagai, Yan Xia, and Toshiharu Teranishi*

Nano Research, **2025**, 18, 94907284
<https://doi.org/10.26599/NR.2025.94907284>

This review summarizes the direct one-step synthesis of three-dimensional nanoparticle superlattices. Characterization techniques to examine the mechanism of superlattice formation and the structural changes of superlattices specific to this approach are also discussed.



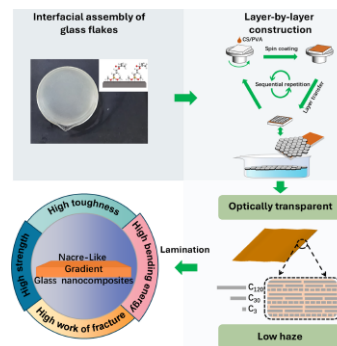
Research Articles

Nacre-like heterogeneous glass nanocomposites from interfacial assembly

Canyu Cui, Jian Zhu, Shouhua Feng, and Ming Yang*

Nano Research, **2025**, 18, 94907173
<https://doi.org/10.26599/NR.2025.94907173>

Heterogeneous and gradient glass nanocomposites, created through interfacial assembly, demonstrate an exceptional combination of flexural strength, bending energy, fracture toughness, and work of fracture, while maintaining high transparency and ultralow haze.

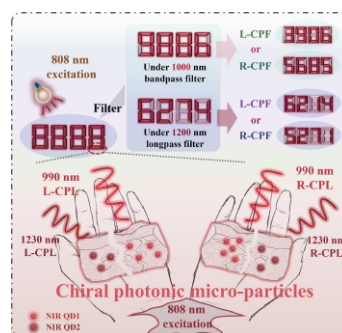


Chiral photonic micro-particles enabling circularly polarized luminescence for NIR-II optical anti-counterfeiting

Jiang Huang, Xuefeng Yang, Xue Jin, Hongchao Yang*, and Pengfei Duan*

Nano Research, **2025**, 18, 94907182
<https://doi.org/10.26599/NR.2025.94907182>

The combination of chiral photonic micro-particles (CPMPs) with near-infrared (NIR) II luminescent quantum dots enables multi-color high g_{lum} NIR circularly polarized luminescence (NIR CPL). This simple strategy expands the applications of NIR CPL materials in cutting-edge encryption applications such as displays and information encryption.



Morphology

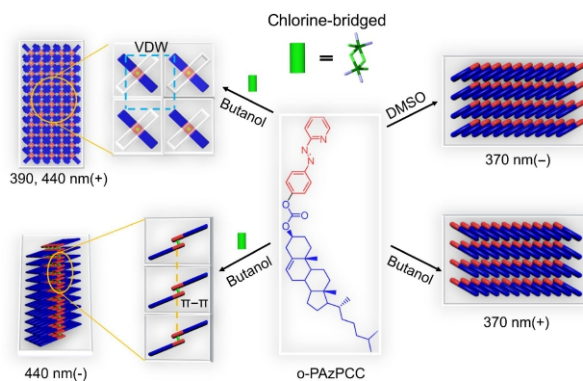
Research Article

Chirality inversion via van der Waals interactions to π - π stacking in non-equilibrium assembly within a narrow temperature range

Peiwen Chen, Kuo Fu, Xiangyang Zhang, Shengyin Zhao*, Hongwei Wu*, and Guofeng Liu*

The solvent-induced chirality inversion of ortho-pyridine-azo-cholesterol (o-PAzPCC) motifs with opposite stacking modes, as well as the temperature-regulated chirality inversion of the chloro bridged Cu^{2+} /o-PAzPCC supramolecular assembly system, is achieved within a narrow range (283 to 293 K). This inversion is driven by the interplay between van der Waals forces and π - π stacking interactions, leading to dynamic morphological transformations from nanosheet to nanoribbon structures.

Nano Research, **2025**, 18, 94907095
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Back Cover

Nano biology

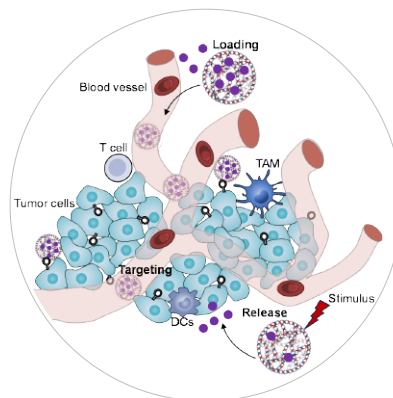
Review Articles

DNA nanostructures-based delivery system for cancer immunotherapy

Rui Zhang, Tailing Xue, and Dayong Yang*

The review summarizes DNA nanostructures-based materials, which are extensively utilized as effective delivery system for cancer immunotherapy to achieve tunable loading, precise targeting, and controllable release.

Nano Research, **2025**, 18, 94907178
<https://doi.org/10.26599/NR.2025.94907178>



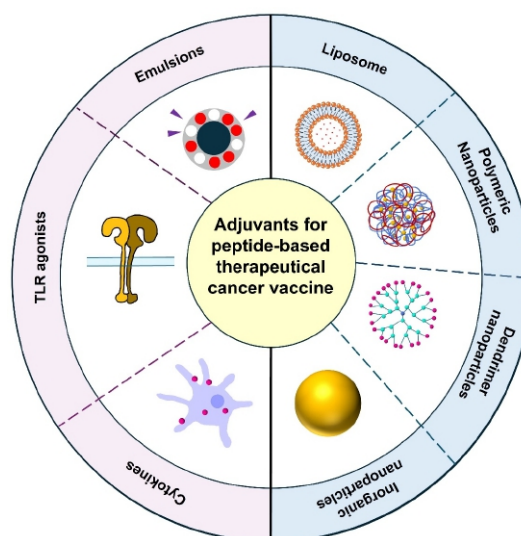
Advances in nanotechnology-enabled adjuvants for peptide-based cancer vaccines

Mengwen Li, Wenpan Li, Zhi Li, and Jianqin Lu*

This review highlights recent advancements in nanoadjuvants and explores their potential for clinical translation.

Nano Research, 2025, 18, 94907534

<https://doi.org/10.26599/NR.2025.94907534>



Research Articles

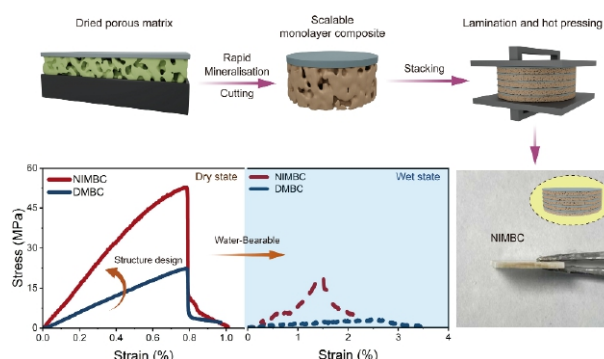
Water-bearable nacre-inspired composite via matrix-induced rapid mineralization as potential compact bone repair material

Yu-Lu Yang, Zhong-Yuan Yang, Qing-Sheng Zeng, Zi-Han Yang, Chao Fang, Zhi Chen, Duo-Hong Zou*, Li-Bo Mao*, and Shu-Hong Yu*

Fabrication of water-bearable nacre-inspired composites via matrix-induced rapid mineralization and their mechanical and biological performance were reported.

Nano Research, 2025, 18, 94907143

<https://doi.org/10.26599/NR.2025.94907143>



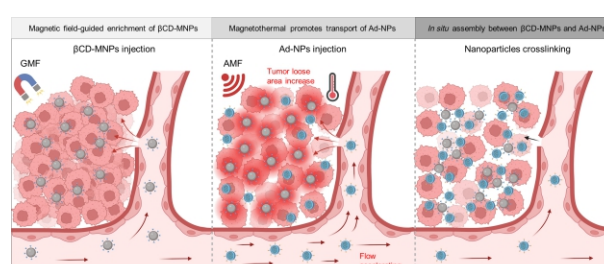
Magnetically actuated aggregation of nanoparticles via host-guest interaction for extracellular targeted drug delivery and cancer immunotherapy

Fangzheng Li, Yueqiang Zhu, Dongli Qi, Chaoran Chen, Hao Li, Ziyang Cao*, and Xianzhu Yang*

Magnetically actuated nanoparticles accumulate and *in situ* aggregate at tumor sites, enhancing the extracellular targeted drug delivery efficiency and improving antitumor efficacy.

Nano Research, 2025, 18, 94907164

<https://doi.org/10.26599/NR.2025.94907164>



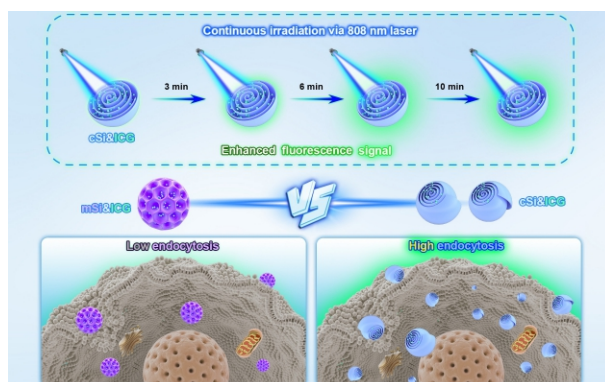
Uniformed mesoporous silica with unique chiral architecture for enhanced endocytosis and fluorescence imaging

Siyagi Li, Xiangyu Wang, Ziqian Zhang, Lei Wang, Fulin Lin, Ran Wang, Xiaolong Liu, Wen Sun*, Peiyuan Wang*, and Fangqin Xue*

The work reports chiral mesoporous silica fabrication with indocyanine green (ICG) loading which presents higher endocytosis and enhanced fluorescence signal under continuous 808 nm light illumination. Furthermore, thanks to the targeted accumulation of chiral nanostructured mesoporous silica (cSi) nanocarriers in tumor tissues and its ability to synergistically promote photothermal augmented chiral-specific tumor cell killing, the malignant tissue is effectively suppressed, heralding a new way in cancer fighting.

Nano Research, **2025**, 18, 94907353

<https://doi.org/10.26599/NR.2025.94907353>



Nano detection

Review Articles

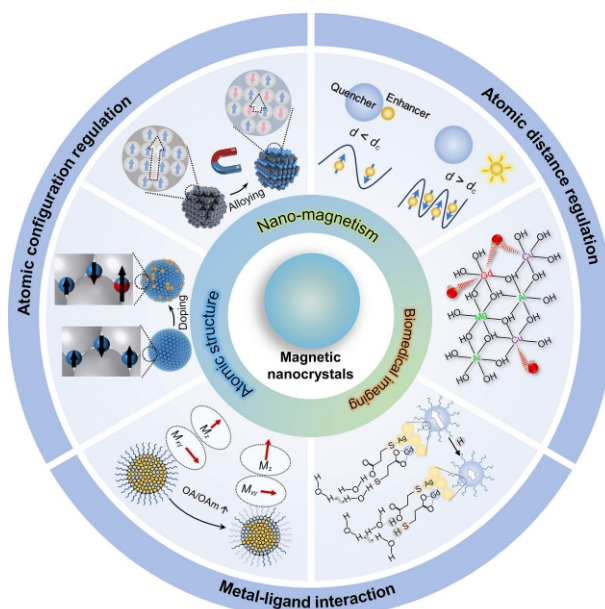
Atomic-level magnetism modulation of nanocrystals for biomedical imaging

Yuehao Gan, Hui Du, Qiyue Wang, Fangyuan Li*, and Daishun Ling*

Through the atomic-level magnetism modulation, such as metal alloying and ion doping, distance-dependent magnetic interactions and metal-ligand interaction-mediated magnetism modulation, the key magnetic parameters such as saturation magnetization (M_s), magnetic moment (μ_B), and coercivity can be precisely tuned to meet specific imaging requirements and improve the performance of nanocrystals in biomedical applications.

Nano Research, **2025**, 18, 94907251

<https://doi.org/10.26599/NR.2025.94907251>



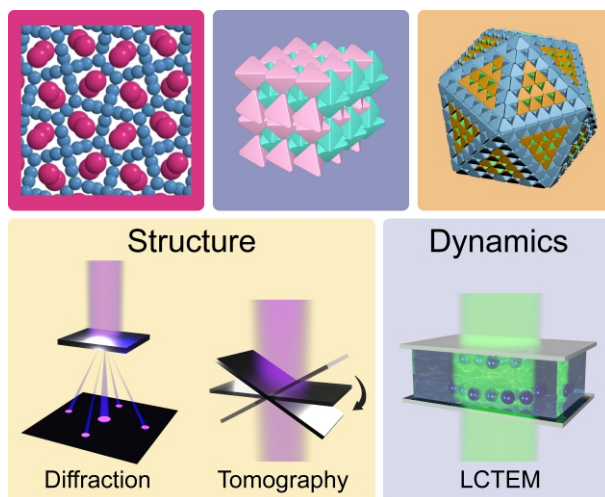
Electron microscopy in nanoparticle self-assembly research

Jun Chen, Chenyu Yan, Baixu Zhu, Chuanliang Huang, Fanrui Cheng, Hanyi Duan, and Xingchen Ye*

This review highlights the utility and advantages of various electron microscopy techniques for characterizing the structures and dynamics of nanoparticle assemblies, ranging from conventional imaging and diffraction techniques to cutting-edge approaches such as electron tomography, focused ion beam scanning electron microscopy tomography, four-dimensional scanning transmission electron microscopy, and liquid cell transmission electron microscopy. We anticipate that the comprehensive electron microscopy toolkit, combined with advanced computational algorithms and machine learning, will continue to generate new knowledge and insights in nanoparticle self-assembly research.

Nano Research, **2025**, 18, 94907286

<https://doi.org/10.26599/NR.2025.94907286>



Research Article

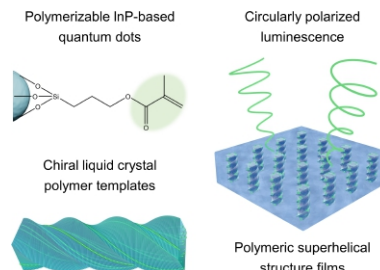
Polymerization-with-assembly enables homogeneous circularly polarized luminescence structures

Mingjiang Zhang, Wenting Gao, Shanshan Zhao, and Taotao Zhuang*

Nano Research, **2025**, 18, 94907150

<https://doi.org/10.26599/NR.2025.94907150>

This paper develops an *in-situ* helical co-assembly polymerization strategy that covalently integrates polymerizable InP-based quantum dots into chiral liquid crystal polymer templates, forming homogeneous polymeric superhelical structures with intense circularly polarized luminescence. This approach overcomes challenges of quantum dot phase separation, stability, and dispersion in chiral liquid crystal matrices, offering a novel approach to advanced circularly polarized luminescent materials for applications.



Nano device

Research Articles

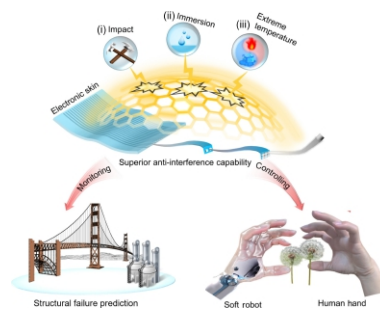
Unique nanowire assemblies enables superior anti-interference capability for accurate structural failure prediction and soft robotics

Xin-Lin Li, Cheng Chen, Zhong-Yuan Yang, Xiang-Sen Meng, Yin-Bo Zhu, Xue-Fei Feng, Yu-Cheng Gao, Wen-Ze Wang, and Jian-Wei Liu*

Nano Research, **2025**, 18, 94906990

<https://doi.org/10.26599/NR.2025.94906990>

A transparent electronic skin was fabricated with the coexistence of wrinkles and cracks, outstanding anisotropic strain sensing performance, and superior anti-interference capability to other stimuli and harsh conditions by a simple and scalable assembly technique. The electronic skin has been successfully applied to interference-free and precise structural failure prediction and soft robotics.



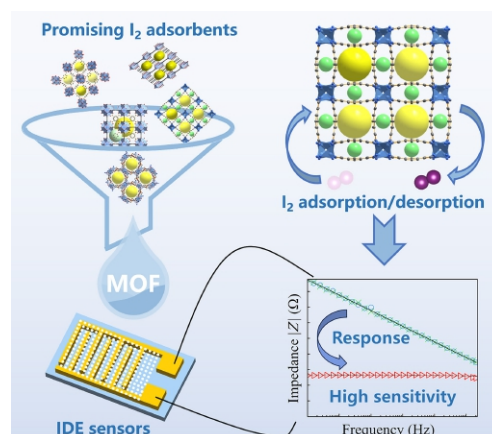
Facile strategy for screening and fabricating metal-organic framework-based sensors for highly sensitive detection of iodine gas

Haoyi Tan, Hongbin Zhao, and Guangcun Shan*

Chemically stable metal-organic frameworks with good affinity for iodine (including Zn(1,3-BDP), UiO-66, UiO-66-NH₂, etc.) were computationally screened and drop-casted upon interdigitated electrodes to achieve highly sensitive electrical detection of iodine gas. The effect of nitrogen functionalization and the underlying sensing mechanism were revealed.

Nano Research, **2025**, 18, 94907551

<https://doi.org/10.26599/NR.2025.94907551>



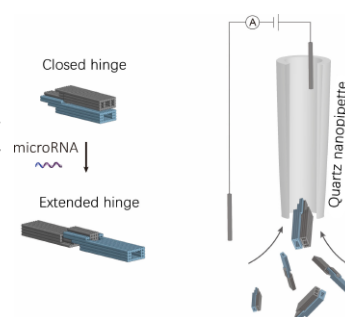
Reconfigurable DNA origami hinges for nanopore detection of microRNA

Liquan Long, Joshua A. Johnson, Ren Ren, Lorenzo Di Michele*, Joshua B. Edel*, and Aleksandar P. Ivanov*

A reconfigurable DNA origami hinge enables ultrasensitive and selective nanopore-based detection of miRNA in human serum, showcasing single-molecule resolution with nanomolar sensitivity and high sequence specificity.

Nano Research, **2025**, 18, 94907604

<https://doi.org/10.26599/NR.2025.94907604>



Nano unit

Review Articles

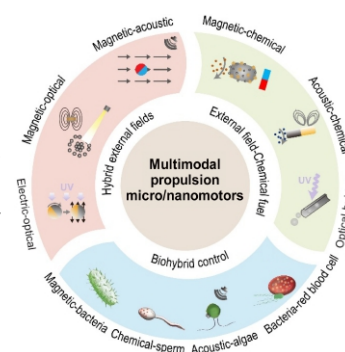
Micro/nanomotors from single modal to multimodal propulsion

Changjin Wu*, Xiaolai Li*, and Ho Cheung Shum*

This review aims to provide a comprehensive understanding of the propulsion mechanisms, fabrication techniques, and applications of the multimodal micro/nanomotors (MNM), thereby serving as a springboard for further advancements in the field of MNMs.

Nano Research, **2025**, 18, 94907105

<https://doi.org/10.26599/NR.2025.94907105>



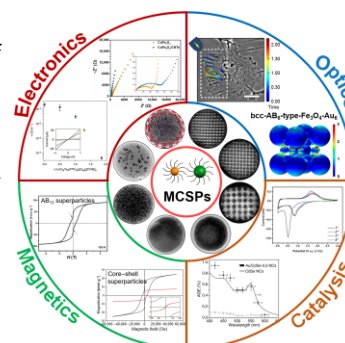
Multi-component nanocrystal supraparticles: Colloidal self-assembly and application

Wenlong Fu and Peng-peng Wang*

This review thoroughly discusses the influencing factors in the formation of multicomponent nanocrystal supraparticles through the emulsion strategy and highlights the resulting novel properties and their corresponding applications.

Nano Research, **2025**, 18, 94907120

<https://doi.org/10.26599/NR.2025.94907120>



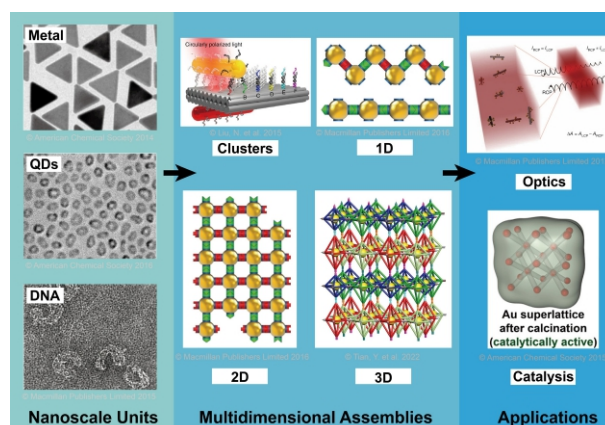
Programmable bottom-up self-assembly of nanomaterials at the nanoscale and microscale

Min Ji*, Haiyue Gong, Mushi Peng, Peixin Li, Xiaolin Xie, Zhaoyu Zhou, Xiaoxue Hu, and Ye Tian*

The assembly of nanoscale units into multidimensional structures for diverse applications is achieved through bottom-up strategies.

Nano Research, 2025, 18, 94907174

<https://doi.org/10.26599/NR.2025.94907174>



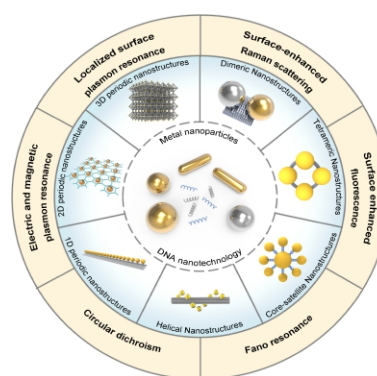
DNA-based plasmonic nanostructures with tailored optical responses

Renjie Niu, Jiale Du, Wenqing He, Bing Liu*, and Jie Chao*

Nano Research, 2025, 18, 94907197

<https://doi.org/10.26599/NR.2025.94907197>

This review encompasses the development of DNA nanotechnology and its application in constructing plasmonic nanostructures featuring diverse geometric configurations. It emphasizes the tailored optical responses of these structures, including surface-enhanced Raman scattering (SERS), fluorescence enhancement, and chirality.



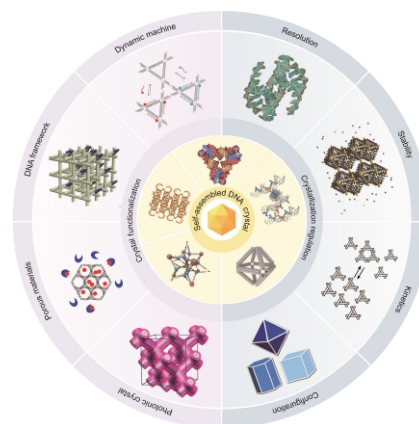
Design, regulation, and functionalization of self-assembled DNA crystals

Ziyu Li, Mingqiang Li, Xiaoguo Liu*, and Jieli Chen*

Self-assembled DNA crystals are crystalline nanomaterials formed by complementary base pairing of DNA molecules. They have atomic-level high precision and are highly programmable. This article reviews the history and recent developments of this rising field.

Nano Research, 2025, 18, 94907250

<https://doi.org/10.26599/NR.2025.94907250>



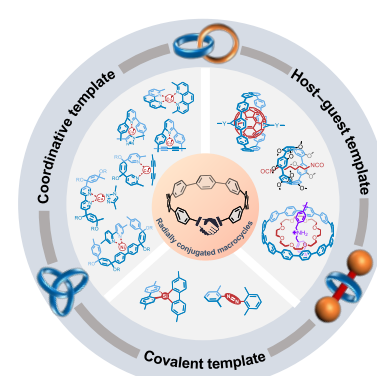
Mechanically interlocked molecules consisting of radially conjugated macrocycles

An Bu and Huan Cong*

Nano Research, 2025, 18, 94907549

<https://doi.org/10.26599/NR.2025.94907549>

Mechanically interlocked molecules consisting of radially conjugated macrocycles are synthetically challenging and intriguing targets. Herein, the structural designs and synthetic approaches of these molecules are summarized from a topological perspective.



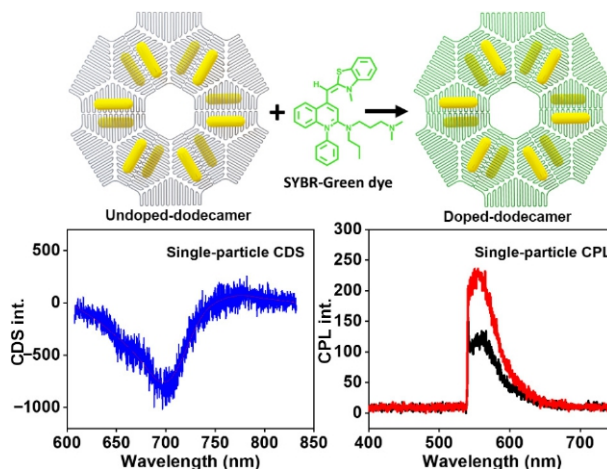
Research Article

Single-particle insights into the optical activity of planar-layered chiral plasmonic superstructures

Majid Khan, Cong Han, Hao Li, Bingqian Dong, Deyan Li, Zakir Khan, Huatian Hu, Jiawei Sun*, Weihai Ni*, and Xiang Lan*

In this study, the chiroptical properties of planar-layered chiral superstructures (dodecamers) of gold nanorods assembled by DNA origami are finely tuned by varying the nanorod sizes, exhibiting increasing g -factors with increasing size. Circular dichroism (CD) spectroscopy was employed to characterize the superstructure ensembles, while circularly polarized luminescence (CPL) and circular differential scattering (CDS) were measured at the single-particle level. These chiroptical properties were considered to correlate with the optical chirality profile of the local electromagnetic field arising from the unifying origin, geometrical chirality. Single-particle measurements demonstrate g -factors up to -0.17 for CDS and -0.6 for CPL. These findings showcase the potential of DNA origami-mediated plasmonic assemblies for nanoscale chirality engineering in biosensing, chiral photonics, and metamaterials.

Nano Research, **2025**, 18, 94907416
<https://doi.org/10.26599/NR.2025.94907416>



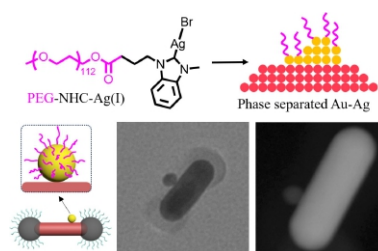
Synthesis

Research Article

Unconventional seed-mediated growth of silver with a macromolecular NHC-Ag precursor

Hanyi Duan, Haiyan Tan, and Jie He*

Silver nucleates and grows on the lateral surface of gold nanorods (AuNRs) while undergoing dewetting.



Nano Research, **2025**, 18, 94907147
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