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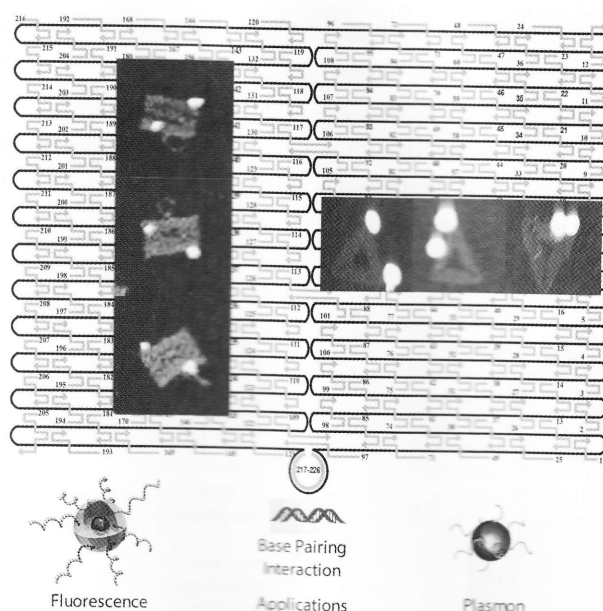
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Pages 249—344

COVER PICTURE

The cover picture highlights the recent progresses in DNA directed self-assembly of colloidal semiconductor quantum dots and metallic nanoparticles heterogeneous nanomaterials. Semiconductor quantum dots and metal nanoparticles hybrids with controlled geometry, distance, and stoichiometry are crucial for the potential applications. While DNA nanotechnology, based on Watson-Crick base-pairing interactions between two single-stranded DNAs, has provided unique opportunities to generate fully programmable, functional metal nanoparticles and semiconductor quantum dots hybrid nanomaterials, and offers precisely control over the spacing, orientation, and chirality of the components. We also discuss the challenges and the trends in DNA directed self-assembly of semiconductor quantum dots and metallic nanoparticles hybrid nanomaterials. More details are discussed in the review by Deng *et al.* on page 259—264.

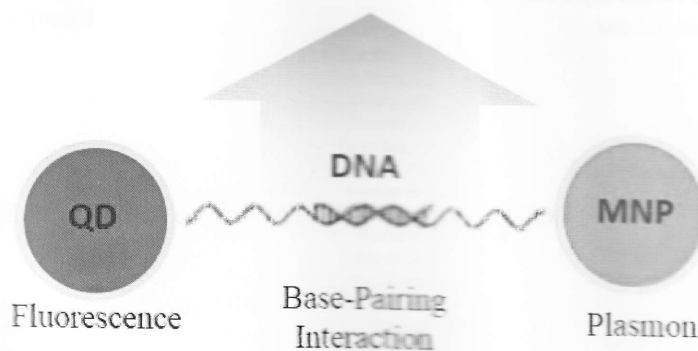


REVIEWS

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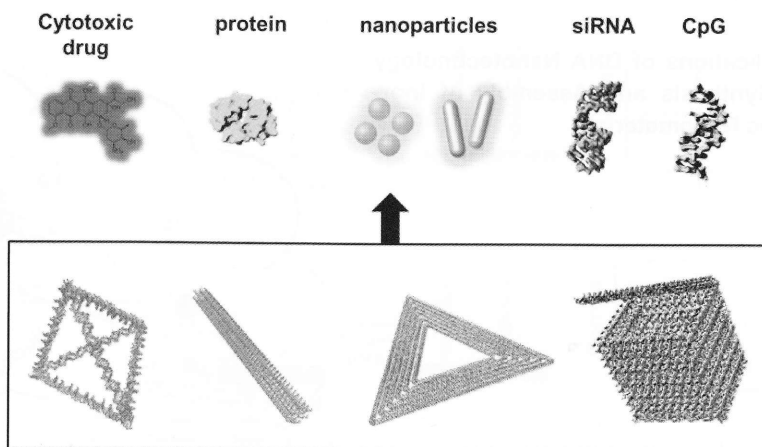
DNA Directed Self-Assembly of Fluorescent Colloidal Semiconductor Quantum Dots and Plasmonic Metal Nanoparticles Heterogeneous Nanomaterials

Potential Applications
Energy, Nanophotonics, Bioimaging, and Biosensing



Yan Guo, Yue Hu, Zhengtao Deng*

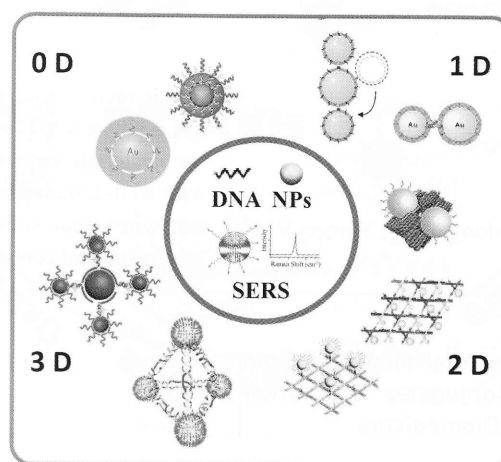
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Self-Assembled DNA Nanostructures for Drug Delivery

Self-assembled DNA nanostructures have been intensively studied for biomedical applications. With their uniform nanoscale sizes, well-defined shapes, precise spatial addressability and prominent biocompatibility, DNA nanostructures show great functional and potential as drug delivery platforms in the biomedical field. In this review, we summarize the recent development of DNA nanotechnology in cancer therapy, and discuss the challenges and potential strategies to advance the methodologies of cancer treatments.

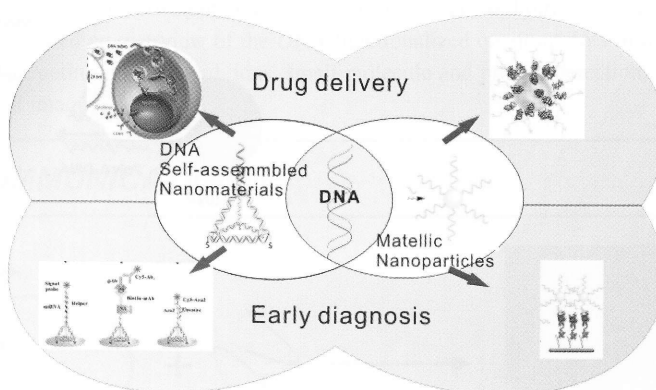
Ruokun Jia, Ting Wang, Qiao Jiang, Zhengang Wang, Chen Song, Baoquan Ding*

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Design and Fabrication of Plasmonic Nanostructures with DNA for Surface-Enhanced Raman Spectroscopy Applications

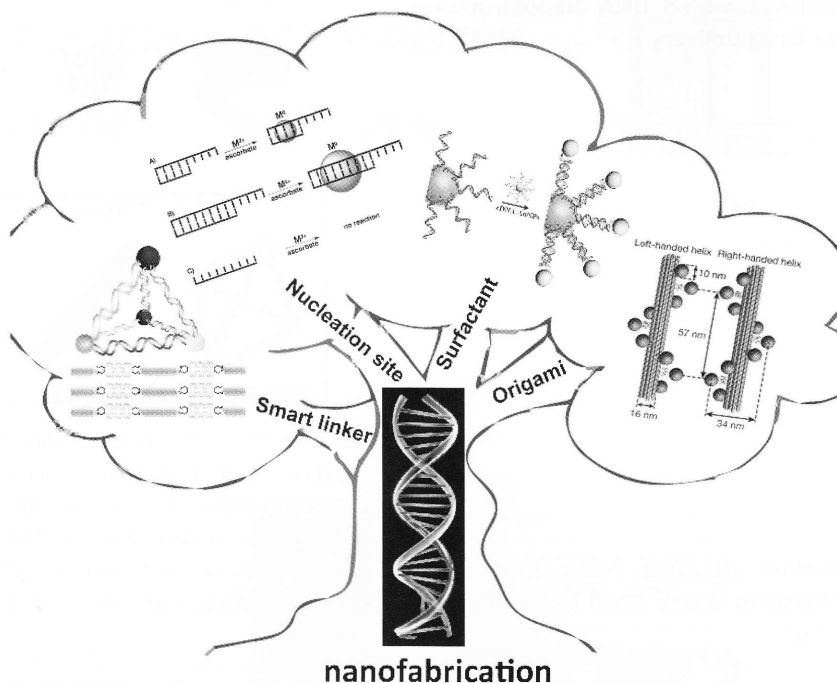
Chunbo Leng, Cheng Wang, Huixin Xiu, Xiangmeng Qu, Lizhen Chen, Qian Tang, Li Li*

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Biomedical Applications of DNA-Nanomaterials Based on Metallic Nanoparticles and DNA Self-Assembled Nanostructures

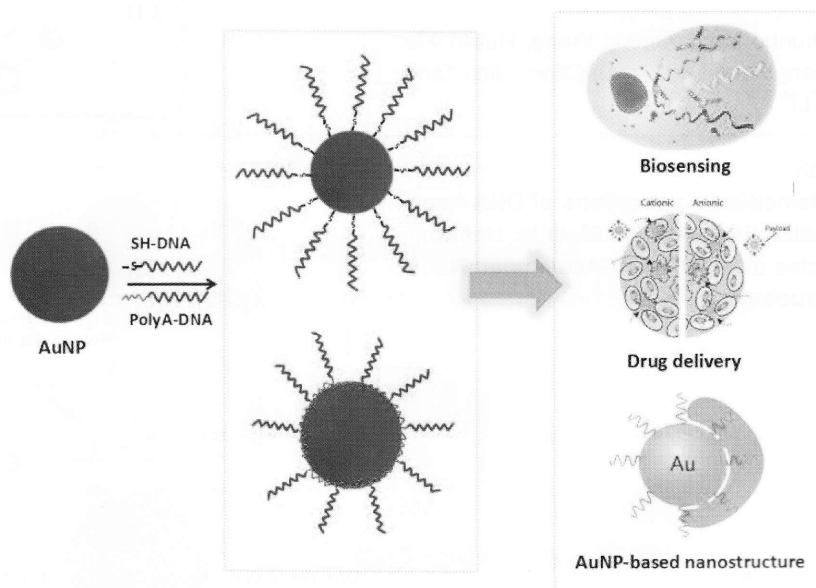
We reviewed the application of DNA-nanomaterials in two biomedical fields: early diagnosis and drug delivery. And in each field, we mainly focused on two kinds of nanomaterials: metallic nanoparticles and DNA self-assembled nanomaterials. We summarized the research of these two kinds of DNA-nanomaterials for biomedical purposes, and finally made some prospectation about their future development.

Yanli Wen, Lanying Li, Lele Wang, Li Xu, Wen Liang, Suzhen Ren, Gang Liu*



In this review, four modes of action of DNA molecules are introduced in a figurative and intuitive way, based on the four different roles it plays in synthesis and assembly of nanomaterials: (a) smart linkers to guide nanoparticle assembly, (b) 2D or 3D scaffold with well-designed binding sites, (c) nucleation sites to directly facilitate Au/Pd/Ag/Cu nanowires, nanoparticles, nano-arrays and (d) serving as capping agents to prevent crystal growth, and control size and morphology.

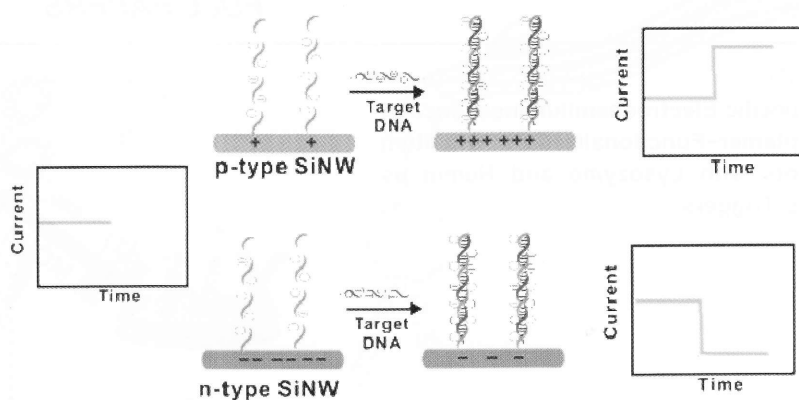
Yurou Ma, Xiangdong Yang, Yurong Wei, Quan Yuan*



Chenguang Wang, Huan Zhang, Dongdong Zeng, Lili San, Xianqiang Mi*

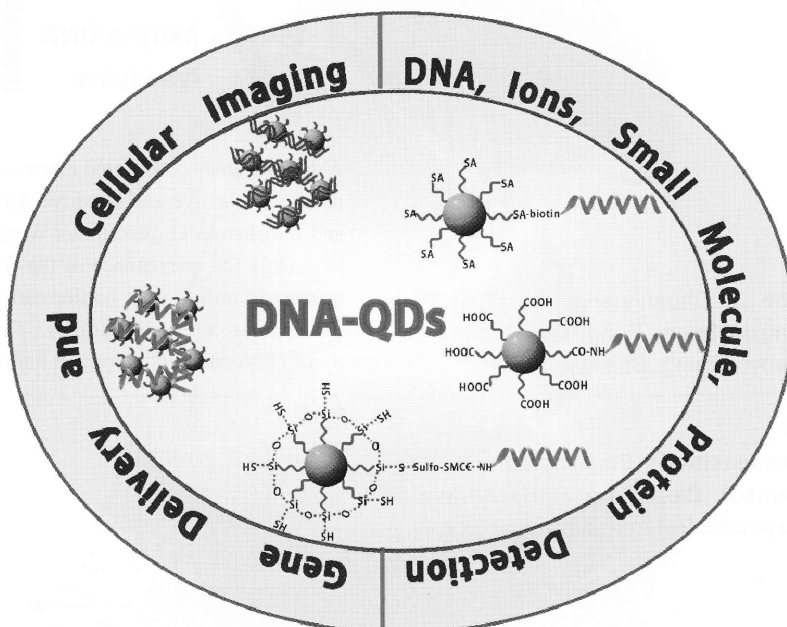
This review mainly focuses on recent advances in the design and synthesis of conjugates of AuNPs by DNA-AuNP interactions. And we also discuss a variety of bioapplications of AuNP-based conjugates, such as biosensing, drug delivery and novel nanostructure.

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Progress in Silicon Nanowire-Based
Field-Effect Transistor Biosensors for
Label-Free Detection of DNANa Lu, Anran Gao, Hong Zhou, Yi Wang,
Xun Yang, Yuelin Wang, Tie Li*

We review the recent progress in SiNW-FET sensors for label-free electrical DNA detection.

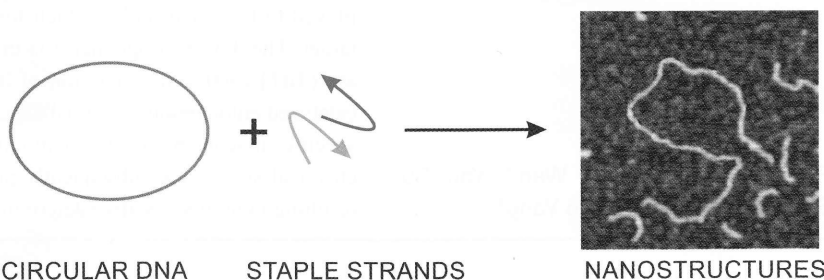
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DNA Functionalized Fluorescent
Quantum Dots for Bioanalytical Ap-
plicationsCuiling Zhang, Caiping Ding, Dongshan
Xiang, Li Li, Xinghu Ji, Zhike He,*
Yuezhong Xian*

The conjugation technologies of DNA to quantum dots were summarized, including electrostatic attraction, covalent attachment, specific effect and direct synthesis. In addition, we provided an overview of the DNA functionalized quantum dots in the bioapplications of targeting nucleic acid, ions, small molecule and protein detection, gene delivery and cell imaging.

COMMUNICATION

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How Small DNA Minicircles Can Be
Applied to Construct DNA Nano-
tubes?

CIRCULAR DNA

STAPLE STRANDS

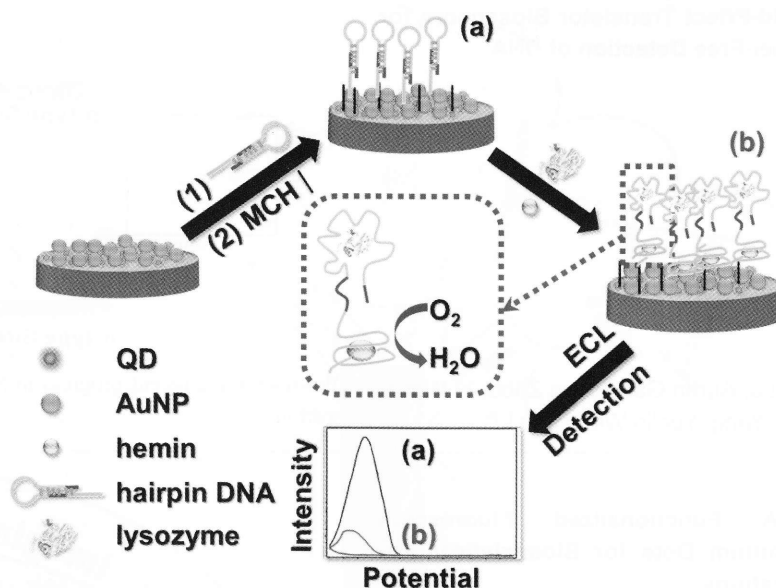
NANOSTRUCTURES

Noshin Afshan, Hongning Zheng,
Shou-Jun Xiao*

Hybridization of circularized oligonucleotides of the designed length with staple strands forms DNA nanotubes.

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Specific Electrochemiluminescence of Aptamer-Functionalized Quantum Dots with Lysozyme and Hemin as Co-Triggers

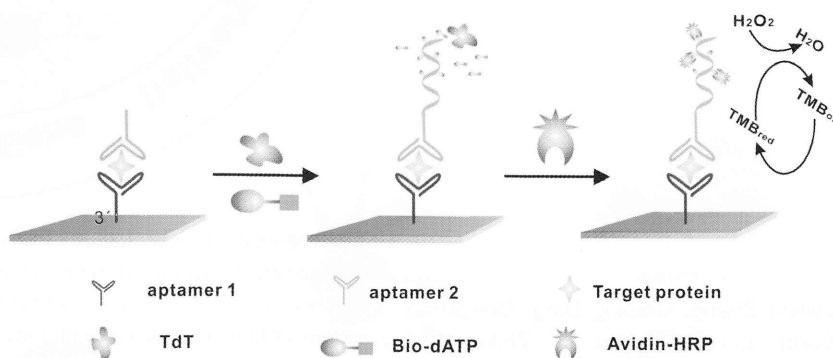


A dual-aptamer-constituted electrochemiluminescent (ECL) aptasensor was fabricated to realize a selective and sensitive detection of lysozyme, in which *anti*-lysozyme aptamer and *anti*-hemin G-quadruplex were fused into a nano-hairpin upon quantum dot emitters. Only the coexistence of the analyte lysozyme and the electrocatalytic cofactor hemin could unfold such conformation, leading to the depletion of dissolved oxygen, the endogenous coreactant for ECL. This method demonstrated the prospective and prosperity of DNA nanotechnology in luminescent bioanalysis.

Xubo Ji, Chuanguang Yao, Ying Wan, Hongxin Song, Peng Xin, Hongda Cui, Chenyu Zheng, Shengyuan Deng*

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Ultrasensitive Electrochemical Aptasensor Based on Surface-Initiated Enzymatic Polymerization



“Sandwich”-structure electrochemical aptasensors (SEAs) are developed for analysis of cancer biomarker carcino-embryonic antigen (CEA). Aptamer 1 is immobilized onto the gold electrode via the 3'-thiol modification, serving as capture probe. Aptamer 2 is employed to be signal probe, which forms a “sandwich” construction with aptamer 1 and target. The 3'-OH of aptamer 2 is then subjected to terminal deoxynucleotidyl transferase (TdT) catalyzed generation of long single-strand DNA (ssDNA). During the TdT catalyzed elongation, biotin labels are incorporated into the long tentacles, allowing the specific attachment of avidin modified horseradish peroxidases (Av-HRPs). Electrochemical signals are subsequently produced by HRP catalyzing TMB- H_2O_2 substrates, resulting in highly sensitive determination of CEA.

Pengjuan Wang, Ying Wan,* Yan Su, Shengyuan Deng, Shulin Yang*