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Synthesis and Fluorescence Properties of 3,6-Diaminocarbazole-modified Pyrrolidinyl Peptide Nucleic Acid

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In this work, an alkyne-modified 3,6-diaminocarbazole (DAC) derivative was synthesized and incorporated into the internal position of azide-modified pyrrolidinyl peptide nucleic acid (acpcPNA) *via* a sequential reductive alkylation-click chemistry protocol previously developed by our group. The DNA-binding and fluorescence properties of DAC-labeled acpcPNA were compared with unmodified acpcPNA. The results revealed that DAC-modified acpcPNA formed complementary DNA hybrids with slightly lower stability compared with the unmodified acpcPNA as shown by melting temperature (T_m) measurement. The specificity was fully retained according to the reduction of the T_m value by more than 20 ºC in the hybrids with single mismatched DNA. In addition, the complementary hybrid of DAC-modified acpcPNA and DNA gave a large fluorescence increase (more than 10 folds relative to the single stranded form) and could clearly distinguish between complementary and single-mismatched DNA hybrids (up to 2.0-6.5 folds difference in fluorescence intensity, depending on sequences). Therefore, DAC-labeled acpcPNA could be used as a biomolecular probe for the determination of DNA sequences.

Keywords DNA sensor; DNA detection; Fluorescence

Synthesis of Hexaphenylbenzene Derivatives Containing ImineMoietyas Fluorescence Turn-OnProbe for the Detection of Metal Ions

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Currently, the design and synthesis of new fluorescent chemosensors for the efficient detection of metal ions is one of the most important research topics in environmental chemistry and biology.In this work, we selecthexaphenylbenzene (HPB) as a fluorophore and imine moiety as a receptor for metal ions. The HPBcontainingsalicylaldehyde group (HPB-SW**1**)issuccessfully obtained via Diels-Alderreactionbetween 2-hydroxy-5(phenylethynyl)benzaldehydeand tetraphenylcyclopentadienone in 51% yield. The targetfluorphores [HPB-SW (**2**-**4**)]are obtained from condensation ofHPB-SW1 with the corresponding amines such as2-amino phenol, butyl amine and ethanolamine in 75-90% yields. These compounds arecharacterized by ^{1}H-NMR, ^{13}C-NMR and HRMS. The addition of Al^{3+} to sensor HPB-SW**2**induces strong blue fluorescence emission while the HPB-SW**3** and **4** show selective turn-on fluorescence towardsZn^{2+} ion. The detection limitof HPB-SW**4**is calculated to be 10.46 ppb for Zn^{2+} which is lower than drinking water permission concentration by world health organization(WHO).

Keywords Zinc ion sensor; Fluorescence sensor; Fluorescence probe turn-on sensor

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Natural Triterpenoids as Renewable Nanos: Hierarchical Self-assembly Yielding Novel Materials for Drug Entrapment and Metal-Nanoparticle Hybrids

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Plant metabolites having diversified structural features and properties are the most significant renewable alternatives to fossil and petroleum resources for a sustainable future. Among different plant secondary metabolites, terpenoids constitute the most numerous and structurally diverse group of natural products having more than 300 ring systems. Computations carried out by us have revealed that the triterpenoids are nanometer long having varied rigid and flexible lengths.[1] We have isolated several triterpenoids from different plants and studied their self-assembly properties in different liquids. Interestingly, all the triterpenoids self-assembled in the liquids at low concentrations affording self-assembled nano- to micro-sized architectures such as helical fibers, vesicles, spheres, etc. (Figure 1).[2-7] The vesicular self-assemblies of arjunolic acid and oleanolic acid have been utilized for the entrapment of anticancer drugs such as doxorubicin and curcumin. The spherical self-assemblies of 18β-glycyrrhetinic acid have been utilized for the templated growth of CdS nanoparticles. Recent results from our laboratory will be presented in the lecture in the perspective of green, renewable and nanos.

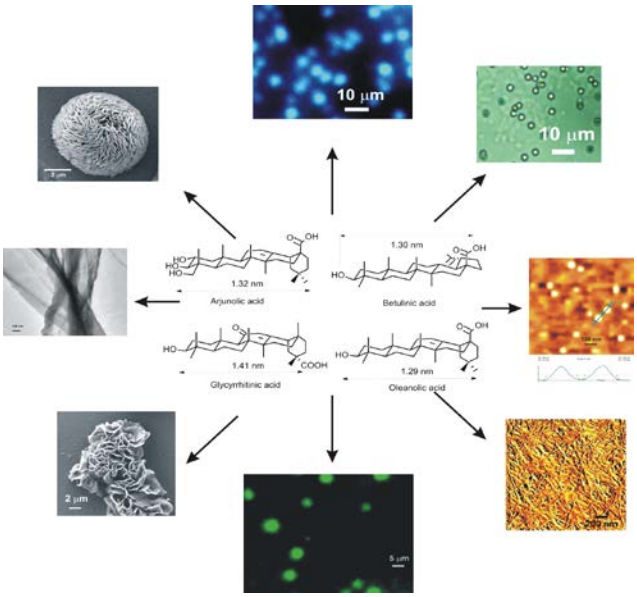

Figure 1. Nano-architectures from

Keywords Triterpenoids; Self-assembly; Nanoparticle; Drug-entrapment; Hybrid-materials

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Synthesis and Application of Organophosphonium Salts in Syntheses and Catalysis

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The use of small organic molecules to induce chemical processes, offers the ability to achieve challenging transformations and simultaneously often avoids toxic, expensive or environmentally hazardous metal-catalysts.

A spects of our research focuses on organophosphonium salts that display a high potential in (asymmetric) Lewis acid mediated organocatalysis or as ligands in homogeneous catalysis.

Organophosphonium salts are readily accessible, easily prepared and in principle bear a stereogenic center. Initial applications of this promising substance classes will be presented.

Keywords Organocatalysis; Phosphonium salts; Syntheses