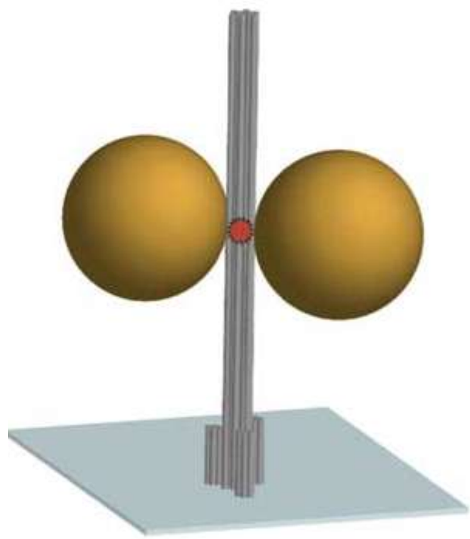
Optical Antenna of Nano-particle in DNA Origami Structures

Introduction

Life and Nano sciences advancement in tandem with developments of high resolution imaging procedures and methods. All through the last decades, the improvement and invention of scanning probe microscopy methods and procedures like AFM (Atomic Force Microscopy) have presented new ideas onto nano-scale materials (Castro et al, pp. 221-229). Optical microscopy has been reached ahead of the diffraction limit and the inspection of single molecules has grown into a standard technology. The proposal seeks support of fabrication of DNA scaffold based nano-scale antennas. Developments in nano-technology and mechanisms of drug delivery paired with the molecular biology, and DNA origami procedures and methods lead to growth and development of new breed of nano-electronics (Fries, et al). The aim and objective of our investigation is the development of nano-scale antenna using configurable DNA structure as a pattern or outline. Even though electrical and chemical features of DNA are limited in functionality, DNA can be utilized as scaffold for functional building component. Such aa arrangement might be enclosed with a thick coating of ~3-4 nm radius metal nano-particles, and considered as an antenna (Fumeaux et al, pp. 123-183).

Description

Nano lenses that are self assembling and utilize DNA as a material for construction represent a better method of visualizing single molecules and might facilitate to unlock various biological processes such as DNA replication or transcription at the level of a single molecule. An advance self-assembling nanolens that utilizes DNA as a major material for construction may imagine single molecules (Hone et al, pp. 666-668). Here, the gray colored DNA origami nanopillar is immobilized at a cover slip. Two 40-50 nm radius nanoparticles of gold acts as a nanoantennae and focus the light at the hot spot present in between the nano particles. Moreover, a fluorescent dye attached at the hot spots acts as an active optical basis and reports on the fluorescence development or improvement (Biercuk, M. J., et al, pp. 2767-2769).



Overlapping plasmonic fields present in between nano-particles serve as nano-antennae in order to focus light far away from the limit of diffraction (Heckman et al, pp. 103304). Such firm focusing may enhance the sensitivity of the applications related to biotechnology. Even though various other single molecule visualization methods and techniques exist, they are expensive and complex (Haun et al, pp. 660-665). It is expected that this self assembly approach may create various nano lenses cheaply and quickly, and that the procedure might affect a vide range of research fields.

Correspondence between a usual and a conventional lens (shown left) focusing a beam of light and the nano-lens (shown right) made with two gold spherical nano-particles on a DNA origami pillar structure (Hone et al, pp. 339-343). Furthermore, the nano-lens may concentrate the beam of light between the particles in a tremendously reduced volume (Dietz et al., pp. 725-730). There are usually two application fields, one involves more basic research on nano-photonics and plasmonic, in view of the fact, with this method, dyes may be placed at a very proximity to various other nano-particle arrangements with nanometric accuracy; the other fields focuses more towards the applications related to bio-molecular studies. Moreover, increase in the fluorescence enhancement may be achieved either by7 reducing the size of the gap present between the nano-particles or may also be achieved by optimizing and increasing the space present in between the nanoparticles (Falabella et al, pp. 12740-12747).

<u>Conclusion</u>

Above research clearly represents the development of nano-scale antenna using configurable DNA structure as a pattern or outline. Even though electrical and chemical features of DNA are limited in functionality, DNA can be utilized as scaffold for functional building component.

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