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Research Publication
Dr. Swarup Kumar Maji (1) Dr. Md. Asif Iqbal (1)

  
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# Graphene Oxide-Wrapped Gold Nanorods for Direct Plasmon-Enhanced Electrocatalysis to Detect Hydrogen Peroxide and in the Hydrogen Evaluation Reaction

Durgadas Datta, Ju Won Lim, Ram Chandra Maji\*, and Swarup Kumar Maji\*

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# Mathematical Studies of non-Newtonian Blood Flow through a Patient-Specific Atherosclerotic Artery

Md. Asif Ikbal<sup>1</sup>, Prashanta Kumar Mandal<sup>2</sup>, Sarifuddin<sup>3†</sup>

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## Abstract

Flow in an atherosclerotic vessel is a much-researched topic for over half a century, however very little is known while passing through a realistic vessel. A Mathematical model of blood flow through IVUS-VH (Intravascular ultrasound-virtual histology) derived patient-specific artery under stenotic condition has been developed. The flowing blood in this patient-specific arterial lumen is considered as the Generalised Newtonian fluid. The non-linear coupled governing equations of motion accompanied by appropriate choice of the initial and boundary conditions are solved numerically by MAC (Marker and Cell) method satisfying suitable stability conditions. Simulated results exhibited through their graphical representations predict the dimensionless pressure drop is less for Newtonian model than its non-Newtonian counterpart and the severity of the roughness contributes much to the number and length of the flow separation regions in an atherosclerotic vessel.

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## 1 Introduction

Atherosclerosis is a kind of disease leading to the malfunction of the cardiovascular system which involves the hardening of arteries due to blood-borne agonists like low-density lipoprotein (LDL), pearly substances etc. [1]. Such abnormal deposition in the arterial wall usually occurs in large and medium-sized arteries [2] that affects the flow which eventually results in cardiac arrest or stroke for human. A lot of attention is focused in recent years to study atherosclerotic flow by leveraging numerical techniques to obtain useful information on early detection, prevention and diagnosis of various arterial diseases. In most cases, consideration of the Newtonian model in diseased conditions or in smaller vessels with low shear rates may be an underestimation, a non-Newtonian fluid model perhaps suits well. A number of studies in atherosclerotic vessels have been carried out by considering the flowing blood as a non-Newtonian fluid [3–9].

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## সৈকত রক্ষিতের ঝুমুরকলি: রাং-এর দামে খাঁটি সোনা

ড.পার্থসারথি হাটি

ঝুমুর, বিশেষত পুরুলিয়া জেলা তথা মানভূমের বিশেষ লোক সাংস্কৃতিক অভিজ্ঞান। এই জেলাবাসীদের সংস্কৃতিতে হল প্রধান গীত। এমন গীতের প্রভাব যে পুরুলিয়ার পার্শ্ববর্তী ও সীমান্তবর্তী বাংলার অঞ্চলগুলোতেও পড়বে, সে বিষয়ে কোনো সন্দেহ নাই। ফলে, সন্নিহিত বাঁকুড়া, পশ্চিম মেদিনীপুর, বীরভূমেও ঝুমুরের যথেষ্ট কদর আছে। ভিন রাজ্যে, বিহার, ঝাড়খন্ড, উড়িষ্যা-র পাশাপাশি উত্তর-পূর্ব ভারতে চা-বাগানে শ্রমিক চালানোর ফলে, বিশেষত আসামের শিলচরে কর্মক্লান্ত শ্রমিকের কণ্ঠে আজও ঝুমুরের সুর ধ্বনিত হয়। রুখা-সুখা পাথুরে পাহাড়-টিলায় ঘেরা পুরুলিয়ার মালভূমি চরিত্রের একদিকে প্রকৃতির অকৃপণ ঔদার্য্য, অন্যদিকে অভিশপ্ত অহল্যার পাষণীরূপ। এখনকার জঙ্গলকেন্দ্রিক মানুষের শোক-স্বস্তি, সুখ-দুঃখ, আনন্দ-বেদনা— সব কিছুরই প্রকাশ আছে ঝুমুরে। তাই ঝুমুর-কে পুরুলিয়া জেলাবাসীর জীবন-বেদ বললে অত্যুক্তি হয় না।

এখনকার গ্রামীণ মানুষ দারিদ্রের জ্বালা নিয়ে ঝুমুরের কাছেই আশ্রয় নেয়। জীবন-বাস্তবতাকে মেনে নিয়ে প্রকৃতির বুকে কণ্ঠে ধরে মাদল-বাঁশির প্রেম-পিরীতি। ফাগুন-দুপুর আড়চোখে দেখিয়ে দেয় ‘পিঁদাড়ে পলাশের বন’। পাথুরে বুকের খাঁজ বেয়ে নেমে আসে নরম সবুজ। শাল-মহুলের বনে চলে আলো-আঁধারের লুকোচুরি খেলা। ধামসা-মাদলের তালে নাচে গ্রামীণ জীবন। দূরান্তের হৃদয়ও ঝুমুরের সুরে মাতাল হয়। এটাই তো প্রেমের মাটি। হড়কা বানে পাথরে পিছল খায় পা— ‘বতরে পিরিতের ফুল ফোটে’। পাথুরে মাটির বুকে শয্য ফলানোর অদম্য চেষ্টায় লাঙলের ফালে যে ক্লান্তি লেগে থাকে, সেই ক্লান্তিমোচনে সন্ধ্যার বাতাসে বাজে যাদুকরী ঝুমুরের সুর। আজকের গ্লোবলাইজেশনের দিনে আয়ারাম-গয়ারামের ভেঙ্কিতে ঝুমুর তার মান হারালেও মাঠ

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Luminescence-Tunable ZnS–AgInS<sub>2</sub> Nanocrystals for Cancer Cell Imaging and Photodynamic Therapy

Swarup Kumar Maji\*

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**ABSTRACT:** A highly luminescent I–III–VI group of semiconductor nanocrystals (NCs) has attracted considerable attention for applications in biomedical engineering and design of novel optoelectronic devices. In this work, high quality ZnS–AgInS<sub>2</sub> (ZAIS) solid solution NCs were synthesized by thermal decomposition of an organometallic diethyldithiocarbamate precursor complex of (AgIn)<sub>x</sub>Zn<sub>2(1-x)</sub>(S<sub>2</sub>CN(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>)<sub>4</sub> in the presence of specific stabilizing and structure directing agents. By changing the composition of the precursor complex (value of *x*), the structure and optical property could easily be adjustable, thus leading to the formation of nanowire, nanorod, and tetrapod-like NCs and highly luminescent green to yellow to red color tunable NCs. The ZAIS NCs were further transferred to aqueous medium by 3-mercaptopropionic acid (MPA) capping without losing any optical properties. The color-tunable, water-soluble, and biocompatible ZAIS NCs were utilized for the *in vitro* cellular imaging of human cervical cancer cells (HeLa cells) and showed intense localization in the cell cytoplasm after 6 h of incubation. In addition, the inherent photocatalytic property of ZAIS NCs under light illumination showed promising photodynamic therapy of cancer cells, and thus, ZAIS NCs could be a promising candidate for future biomedical applications.

**KEYWORDS:** I–III–VI chalcopyrite semiconductor, ZnS–AgInS<sub>2</sub> nanocrystals, luminescence, bioimaging, reactive oxygen species, photodynamic therapy



## INTRODUCTION

*In vitro* and *in vivo* detection of tumor cells by the fluorescence spectroscopic technique has been a useful and widely used tool for the application in biomedical science.<sup>1–4</sup> Organic dyes, luminescent proteins, noble metals, and semiconductor nanocrystals have been explored for this purpose over the past few years.<sup>5–9</sup> Due to severe drawbacks of organic dyes and luminescent proteins under physiological conditions,<sup>10,11</sup> semiconductor NCs have drawn considerable attention due to broader excitation spectra, narrower and more symmetric emission spectra, resistance against photobleaching, and sometimes different emission colors at a single wavelength excitation.<sup>9,11–15</sup> However, the traditional NCs contain highly toxic elements such as cadmium or lead and therefore are not environmentally friendly for biological purposes.<sup>10,16</sup> This unavoidable disadvantages inspired many researchers over the globe to develop numerous methods to minimize the toxicity and improve the quality of NCs, although there are still lot of doubts regarding their future utilizations in biomedicine.

On the other hand, due to minor systemic toxicity and less side effects compared to the conventional chemo- and radiation therapy, photodynamic therapy (PDT) has been gained considerable interest as an alternative in tumor therapeutics.<sup>17–19</sup> Light-induced generation of reactive oxygen species (ROS) such as superoxide radical anion (O<sub>2</sub><sup>•-</sup>), singlet oxygen (<sup>1</sup>O<sub>2</sub>), and hydroxyl radicals (OH<sup>•</sup>) in the presence of a photosensitizer is the main mechanism for the effective PDT

effect.<sup>20–23</sup> However, the traditional PDT photosensitizer possesses several disadvantages, such as poor stability under physiological conditions, higher photobleaching, and quick circulation in body, and thus further restricts their biomedical applications.<sup>24,25</sup> In this context, utilization of excellent photocatalytic properties of semiconductor NCs would be an alternative and effective way for killing of cancer cells.<sup>26,27</sup>

In past few years, ternary I–III–VI chalcopyrite semiconductor NCs have attracted intensive research interest in light-emitting diodes, solar cells, photocatalysis, as well as in the biological field, due to their excellent biocompatibility, wonderful optical properties, and extraordinary biochemical stability.<sup>3,28–34</sup> More intensely, the dopant I–III–VI semiconductor, such as ZnS–AgInS<sub>2</sub>, has been recently explored due to its unique adjustable optical and electronic properties with higher quantum efficiency.<sup>10,16,35–40</sup> Recently, in a pioneer work, Torimoto et al. reported the tunable emission colors of AgInS<sub>2</sub> NCs from green to red by integrating various amounts of Zn to change the stoichiometric ratio between Ag, In, and Zn.<sup>41</sup> Many efforts have been made to tune the PL emission property and

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# Anisotropic Plasmonic Gold Nanorod–Indocyanine Green@Reduced Graphene Oxide–Doxorubicin Nanohybrids for Image-Guided Enhanced Tumor Theranostics

Swarup Kumar Maji, Subin Yu, Eunshil Choi, Ju Won Lim, Dohyub Jang, Ga-young Kim, Sehoon Kim,\* Hyukjin Lee,\* and Dong Ha Kim\*

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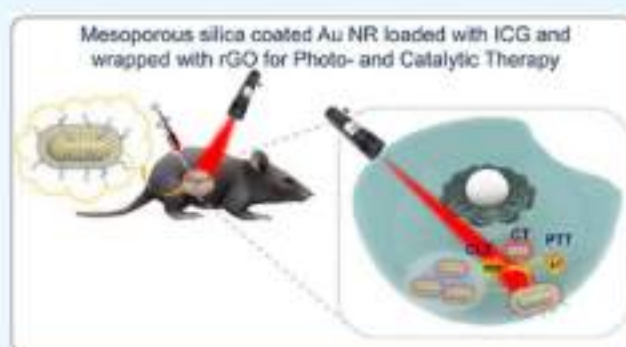
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**ABSTRACT:** The unique physicochemical and localized surface plasmon resonance assets of gold nanorods (GNRs) have offered combined cancer treatments with real-time diagnosis by integrating diverse theragnostic modalities into a single nanoplatform. In this work, a unique multifunctional nanohybrid material based on GNRs was designed for *in vitro* and *in vivo* tumor imaging along with synergistic and combinatorial therapy of tumor. The hybrid material with size less than 100 nm was achieved by embedding indocyanine green (ICG) on mesoporous silica-coated GNRs with further wrapping of reduced graphene oxide (rGO) and then attached with doxorubicin (DOX) and polyethylene glycol. The nanohybrid unveiled noteworthy stability and competently protected the embedded ICG from further aggregation, photobleaching, and nucleophilic attack by encapsulation of GNRs-ICG with rGO. Such combination of GNRs-ICG with rGO and DOX served as a real-time near-infrared (NIR) contrast imaging agent for cancer diagnosis. The hybrid material exhibits high NIR absorption property along with three destined capabilities, such as, nanozymatic activity, photothermal activity, and an excellent drug carrier for drug delivery. The integrated properties of the nanohybrid were then utilized for the triple mode of combined therapeutics of tumor cells, through synergistic catalytic therapy and chemotherapy with combinatorial photothermal therapy to achieve the maximum cancer killing efficiency. It is assumed that the assimilated multimodal imaging and therapeutic capability in single nanoparticle platform is advantageous for future practical applications in cancer diagnosis, therapy, and molecular imaging.



## INTRODUCTION

The recent development of nanoengineered multifunctional structures in the areas of nanotechnology has engendered a great deal of interest by the worldwide scientific community, which could be possibly cast off in a clinical tactic for a concurrent merger of multidagnostic tests and single and collective treatments, the so-called nanotheranostic devices.<sup>1–4</sup> The proper selection of the desired criterion features would be able to give a significant reduction in drug doses with an ensuing decrease of unfavorable side effects and fusion of more than one therapeutic treatments for enhancing the therapeutics with a real-time monitoring ability and could be very useful for the premature analysis of cancer and further life threatening diseases.<sup>5</sup>

The anisotropic GNRs among the several diverse gold nanostructures, have attracted much attention in cancer theragnosis owing to their exceptional optical, photothermal, and biocompatible properties.<sup>6,7</sup> In past few years, an extensive study has been made in various fields of applications, such as multiphoton imaging,<sup>8,9</sup> photoacoustic imaging,<sup>10,11</sup> biosensing,<sup>12,13</sup> hyperthermia therapy,<sup>14,15</sup> drug/gene delivery,<sup>16,17</sup>

catalysis,<sup>18,19</sup> optical recording and data storage,<sup>20,21</sup> and image guided cancer therapy.<sup>22,23</sup> The most fascinating features for all these applications are based on the tunable localized surface plasmon resonance (LSPR) property, which is originated by the interactions of pacified light with the nanocrystals, which then induce powerful local field enrichment at the tips.<sup>24</sup> The generated enhance field could be exploited to activate drug release for chemotherapy and/or creation of reactive oxygen species (ROS) for photodynamic therapy and/or to provide hyperthermal cancer therapy.<sup>25,26</sup> On the other hand, indocyanine green (ICG), which is a prototypical dye with solid absorption band at about 800 nm, is a FDA approved near-infrared (NIR) active amphipathic tricyanocyanine dye for

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# Sophisticated plasmon-enhanced photo-nanozyme for anti-angiogenic and tumor-microenvironment-responsive combinatorial photodynamic and photothermal cancer therapy

Subin Yu<sup>a</sup>, Dohyub Jang<sup>b,c</sup>, Swarup Kumar Maji<sup>a</sup>, Kyungwha Chung<sup>a</sup>, June Sang Lee<sup>a</sup>, Filipe Marques Mota<sup>a</sup>, Jianfang Wang<sup>d</sup>, Sehoon Kim<sup>c,e,\*</sup>, Dong Ha Kim<sup>a,f,g,\*</sup>

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## ABSTRACT

In the exploitation of nanozymes possessing intrinsic enzyme-like activities for cancer therapy, minor focus has been devoted to plasmonic nanostructures with localized surface plasmon resonance (LSPR)-driven properties. Here, we report the application of unique peroxidase-mimicking plasmonic photo-nanozymes coupling tumor-microenvironment-responsive reactive oxygen species generation with photothermal effect for effective combinatorial therapy. The well-defined anisotropic photo-nanozyme is synthesized by selectively depositing Pd nanoparticles on the tips of gold nanopyramids. Intrinsic peroxidase-like properties with 1.5-fold-activity enhancement under photoexcitation are ascribed to a Pd-induced hot electrons/holes separation with efficient H<sub>2</sub>O<sub>2</sub> decomposition. The LSPR-induced photocatalytic/photothermal combinatorial effects are remarkably enhanced upon H<sub>2</sub>O<sub>2</sub> addition, critically suppressing the cell survival rate under near-infrared light. An effective decomposition of cell-signaling H<sub>2</sub>O<sub>2</sub> additionally reveals prominent expression hindrance of vascular endothelial growth factor and hypoxia-inducible factor 1 $\alpha$ . Our seminal findings uncover an interrelation between LSPR-induced phenomena and biomimetic fingerprints, valuable to overcome the shortcomings of conventional photodynamic therapy.

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## Introduction

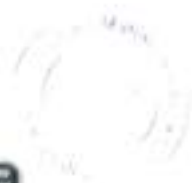
The exploitation of increasingly sophisticated nanomaterials with suitable stability, facile size and shape modification, and tunable activities has emerged as an alternative strategy in cancer therapy [1–3]. The utilization of nanozymes with intrinsic enzyme-like activities, enzymatic kinetics, and underlying mechanisms similar to peroxidases found in nature has been explored in the past few years as a new approach for reactive oxygen species (ROS)-mediated catalytic cancer treatment [4–6]. The concept was first unlocked while showcasing the intrinsic peroxidase-like

properties of Fe<sub>3</sub>O<sub>4</sub> nanoparticles, with an effective ROS generation through the decomposition of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) in the treatment of wastewaters [7]. Since then, effectively generating ROS *in situ* without inducing a local O<sub>2</sub> consumption has received increasing focus in cancer treatment [8–10]. In particular, transition metal nanoparticles (NPs), including Pt, Mn and Pd, gained attention as enzyme-like nanomaterials. Pd NPs possess peroxidase-like activities in acidic conditions likely beneficial for catalytic cancer therapy [8].

The rational design of novel biomimetic peroxidase-like nanozyme systems ideally provides a pathway to couple the fingerprints of inherent enzymatic activity with the properties of the integrated nanocomponents. In this work, we direct our attention to photo-absorbing anisotropic plasmonic nanostructures with great promise in cancer treatment due to their localized surface

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# Khatra Adibasi Mahavidyalaya

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Summary Sheet corresponding to Excel Template 3.3.1 (2020)

<b>Research Publication</b>	
Dr. Tuhin Majumdar	1
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Khatra - Bankura

**REPRESENTING THE MARGINALISED IN GRAPHIC NOVEL *BHIMAYANA*:  
EXPERIENCES OF UNTOUCHABILITY: INCIDENTS IN THE LIFE OF BHIMRAO RAMJI  
AMBEDKAR**

**Dr. Tuhin Majumdar**

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An ideal society must be homogenous in scope, opportunities and treatment. Caste system in India has ruptured the homogeneity by unfairly privileging a certain caste over the other merely on basis of their birth. Regressive concepts like 'untouchable' and 'outcastes' have rotten the social fabric of this country. Politics of dehumanisation has been concomitant with caste discrimination. The outcastes are labelled as sub-human and pushed to the peripheries. Belonging to the lowest strata of Hindu caste system, the outcastes have been condemned to become shit-cleaners and scavengers. Series of deaths of lower-caste workers engaged in cleaning sewers are reported from all corners of the country.

Literatures across time has been voicing the gross human rights violation of the marginalised. The present study involving a graphic novel intertwines the inscriptive and the images to acknowledge the prime role of Bhimrao Ramji Ambedkar in educating the margins and emboldening them to agitate for their rights. The graphic novel in question is *Bhimayana: Experiences of Untouchability: Incidents in the life of Bhimrao Ramji Ambedkar*, published in 2011 by Navayana publications. It is illustrated by Gond artists Durgabai Vyam and Subhash Vyam and written by Srividya Natarajan and S. Anand. The narrative chronicles the experiences of caste-discriminations faced by Bhimrao from his childhood to his becoming of a revolutionary agitating for the rights of the marginalised.

It is pertinent to mention that I have not reproduced in this study any images for reference. The inscriptions are quoted for reference. However, to experience the multi-modality of meaning-producing, one must go through the interaction between the images and inscriptions shown in the graphic novel *Bhimayana*. The basis of this study is a critical commentary on how the graphic novel *Bhimayana* denounces the malicious practice of caste prejudice, and register protest against it.

The graphic novel *Bhimayana* comprises of a main narrative on Ambedkar's experience and confrontation with caste discrimination. This main narrative is supported by a frame narrative dealing with a conversation between a man and a lady. The graphic novel begins with the frame narrative debating on the burning issue of reservation quotas in jobs. A man from the privileged caste fumes at the reservation policy. In his opinion, "damn job quotas for Backward and Scheduled Castes" (*Bhimayana* 11) have dashed his job scope to the grounds. The other conversant, a lady, makes him aware of the reality that "caste never seems to go away" (*Bhimayana* 11) though people claims that caste is a "non-issue" and "not real" (*Bhimayana* 12). To corroborate her point she refers to the brutal killings of Khairlanji where "Surekha, Priyanka, Roshan and Sudhir & members of the Bhotmange family were bludgeoned to death in full view of people of the village" (*Bhimayana* 12) as "Bhotmanges were poor dalits, their education and assertion of their right to a life of dignity was enough to 'provoke' violence" (*Bhimayana* 12).

The next page incorporates a collage of reportages as newspaper-cuttings on violence perpetrated on dalits. One newspaper article reports the incident of Rae Bareli in Uttar Pradesh where two dalit teenagers were "tied with ropes and then dragged for several meters" (*Bhimayana* 13) for allegedly stealing mobile phones. Another newspaper article reports the incident of honour killing in Delhi where the girl and boy were "electrocuted to death" (*Bhimayana* 13) by the girl's family as the boy was a dalit. A ridiculous news of compensation is displayed in another report which narrates an incident in Morena, Madhya Pradesh where a "a dalit woman has been ordered to pay compensation to the high-caste owners of a dog she fed. The woman says the village council wants her to pay a fine of 15,000 rupees" (*Bhimayana* 13). The news of Khairlanji is further displayed in a report depicting

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# वेदाञ्जली

अन्तर्राष्ट्रीय विद्वत्समीक्षित षाण्मासिकी शोधपत्रिका

(International Peer Reviewed Refereed Journal of Multidisciplinary Research)

वर्ष-७

अंक-१३, भाग-२

जनवरी-जून, २०२०

प्रधान सम्पादक

डॉ० रामकेधर तिवारी

असिस्टेंट प्रोफेसर, श्री वैकुण्ठनाथ पवहारी संस्कृत महाविद्यालय  
वैकुण्ठपुर, देवरिया

सह सम्पादक

श्री प्रभून् मिश्र

प्रकाशन : वैदिक एजूकेशनल रिसर्च सोसाइटी, वाराणसी



## हरिनामामृतव्याकरणे पाणिनीयव्याकरणस्य प्रभावः

• अमियकुमारसत्यति:

भूमिका – जगतीतलेऽस्मिन् मानवानां वाग्व्यवहारस्य माध्यमो भवति भाषा। सर्वेऽपि जानन्त्येव यद् भाषाद्वारैव सर्वानपि व्यवहारान् मानवाः परमसरलतया निष्पादयितुं शक्नुवन्ति। वस्तुतस्तु यदि शब्दः खलु व्यवहारमाध्यमं नाभविष्यत्तदा न कोऽपि स्वीयां भावनां परिकटे प्रकाशयितुमवसमात्स्यता। भाषाशिक्षणस्य चत्वारि श्रवण-भाषण-पठन-लेखनरूपाणि कोशलानि प्रथितान्येव सन्ति, तान्येवाश्रित्य कस्याश्चिद्भाषायाः आत्मसात्करणं सुलभेन सिद्ध्यति। भाषास्यपि संस्कृतभाषायाः एकं विशिष्टं स्थानमस्तीति निर्विवादो वादः। संस्कृतभाषायाः गौरवमाध्यात्मिकं सांस्कृतिकञ्च वैभवं स्मरं स्मरम् वयं सर्वदैव गौरवान्विताः भवामः। भारतस्य आध्यात्मिकं सांस्कृतिकञ्च स्वरूपं विश्लेष्यन् सर्वैः समादिश्यते।

अस्य बीजं किमिति प्रश्नस्योत्तरमस्ति अस्याः भाषायाः व्याकरणम्। व्याकरणं भाषायाः संस्कारं सम्पाद्य शब्दानां साधुत्वनिरूपणम्, असाधुशब्दानां निवारणञ्च करोति। वस्तुतस्तु व्याकरणं शब्दानां नियन्त्रणं, परिष्करणं, निर्वचनञ्च सम्पादयति। अतएव भाषायाः प्राणतत्त्वं भवति व्याकरणम्। पुनश्च व्याकरणं विना वाणी न शोभते। कश्चित्तमपि –

“ नमो भाति मदेन स्व जलधरीः पुण्ड्रुना शबरी  
शीलेन प्रमदा जचेन तुरगो नित्योत्सर्वैर्मन्दिरम्।  
वाणी व्याकरणेन हंसमिधुनीर्नद्यः सभा पण्डितैः  
सत्पुत्रेण कूलं त्वया वसुमती लोकत्रयं भानुना ॥” इति।

अतः एषा लोककथा प्रचलिता अस्ति –

“ यद्यपि बहुनाधीये तथापि पठ पुत्र व्याकरणम्।  
स्वजनः स्वजनो माभूत् सकलं शकलं सकृच्छकृत् ॥” इति।

व्याकरणशास्त्रमिदं वेदाङ्गेषु मुख्यतमं स्थानं भजते। अतः उक्तमस्ति – “मुखं व्याकरणं स्मृतम्” इति।

व्याकरणशास्त्रस्य प्रथमः प्रवक्ता – ब्रह्मा - इदमपि कथं जानीमो यद् व्याकरणस्येतिहासः प्राचीनतमो वरीवर्ति। संस्कृतव्याकरणं वेदङ्गत्वात् वेदव्यवहाराधीनमस्तीति प्रमाणपरिपुष्टं तथ्यम्। सर्वासां विद्यानां प्रथमो वक्ता ब्रह्मा बभूव। तद्वत्वा –

“ ॐ ब्रह्मा देवानां प्रथमः सम्बभूव  
विद्यस्य कर्ता भूवनस्य गोप्ता।  
स ब्रह्मविद्यां सर्वविद्याप्रतिष्ठा-  
मथर्चायं ज्येष्ठपुत्राय प्राह ॥” इति।

भाष्यकारेणापि वक्तव्यस्यास्य परिपुष्टिं संसाधितम्। तथाहि – “ब्रह्मा बृहस्पतये प्रोवाच, बृहस्पतिरिन्द्राय, इन्द्रो भरद्वाजाय, भरद्वाजः ऋषिभ्यः, ऋषयो ब्राह्मणेभ्यः।” इति। अत्र विषये प्राचां मतमिदमुपलभ्यते, यत् सर्वासां विद्यानामादिमः प्रवक्ता ब्रह्मैव। प्रवचनमिदं तन्त्र-शास्त्र-शास्त्रनामभिः प्रवृत्तं किल धरण्याम्। अतएव परवर्तिप्रवचनस्य नाम अनुशासनम्, अनुतन्त्रम्, अनुशासमिति कथ्यते लोके। अत्र अनु शब्दः हीनार्थकः। अनेन सिद्ध्यति यत् पुरा प्रोक्तं प्रवचनं समुपलभ्यमानप्रवचनापेक्षया सुविस्तृतमासीदिति।

व्याकरणशास्त्रस्य द्वितीयः प्रवक्ता - बृहस्पतिः - देवानाम्पुरोहितः, सुराचार्यः, गुरुरेव बृहस्पतिः। अस्य मातुर्नाम आसीद् “अङ्गिरा”।

अतएवाऽयम् आङ्गिरसनाम्नापि ख्यातिलेभे। ब्रह्मणः पश्चाद् व्याकरणशास्त्रस्य प्रवक्ता देवगुरुर्बृहस्पतिरासीदिति। स एव अर्थशास्त्रस्य अगदतन्त्रस्य च कर्ता आसीत्। तथ्यमिदमस्ति यद् व्याकरणविषये बृहस्पतेः कापि रचना कुत्रापि दृशोर्विषययतां नास्ति। तथापि परञ्जलिः स्यकीये महाभाष्ये स्वीकरोति यद् देवगुरुर्बृहस्पतिर्व्याकरणस्योपदेष्टेति।

व्याकरणशास्त्रस्य संस्कर्ता - इन्द्रः - इन्द्रोऽपि व्याकरणस्य प्रवक्तेति, येन बृहस्पतेः सकाशात् प्रतिपदपाठक्रमेण शब्दोपदेशस्य ज्ञानमधिगतम्। अनुपीयते यद्व्याकरणस्य प्राचीनं स्वरूपमतिक्रम्यतममासीदिति। महाभाष्ये पतञ्जलिर्निर्दिशति यद् बृहस्पतिरिन्द्राय प्रतिपदोक्तानां

- रामकृष्ण-मिशन्-विद्यामन्दिरम् इत्याख्यस्यस्वयंशासितमहाविद्यालयस्य स्वाभिविवेकानन्द-रिसर्च-सेन्टर् इत्यस्य संस्कृतविभागे शोधशृङ्गायः



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## Summary Sheet corresponding to Excel Template 3.3.1 (2019)

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Kalyan Kanti Dutta	1

Coordinator  
IQAC

Khatra Adibasi Mahavidyalaya  
Khatra, Bankura

Principal  
Khatra Adibasi Mahavidyalaya  
Khatra, Bankura

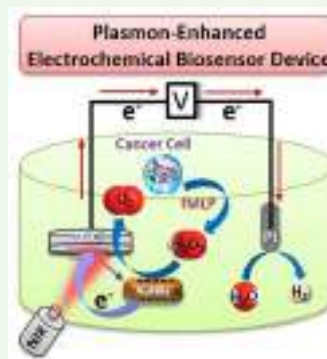
# Plasmon-Enhanced Electrochemical Biosensing of Hydrogen Peroxide from Cancer Cells by Gold Nanorods

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## Supporting Information

**ABSTRACT:** The direct exploitation of generated hot charge carriers originating by localized surface plasmon resonance (LSPR) from a plasmonic metal nanostructure has been an important topic for enhancing the electrocatalytic activity; however, the influence of direct plasmon-accelerated electrocatalytic activity on biosensor device fabrication has not yet been well explored. In this work, cetyltrimethylammonium bromide-capped gold nanorods (AuNRs) were immobilized on a glassy carbon (GC) electrode to fabricate a biosensor device (AuNRs/GC) for the electrocatalytic detection of hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) under LSPR excitation (808 nm,  $2 \text{ W cm}^{-2}$ ). The sensor device exhibited dramatic improvement in the biosensing properties ( $\sim 2\text{--}4$ -fold) with a wide linear range from  $5.0 \mu\text{M}$  to  $5.0 \text{ mM}$ , a lower detection limit of  $1.8 \mu\text{M}$ , and sensitivity of  $1.6 \mu\text{A mM}^{-1}\text{cm}^{-2}$ . The hot charge carriers were produced during plasmon decay and are one of the main reasons for the superior electrocatalytic activity, which directly related to the light wavelength, intensity, and solution pH, along with the attentive photothermal effect for enhanced electrocatalysis. The AuNRs/GC device was finally employed for cancer cell detection by detecting trace amounts of  $\text{H}_2\text{O}_2$  released from cervical cancer cells (HeLa). The finding and concept reveals enhanced electrocatalytic performances by gold nanostructures under LSPR excitation and therefore assures it as a decent candidate for electrochemical energy conversion and electrochemical devices.



**KEYWORDS:** localized surface plasmon resonance, hot charge carriers, hydrogen peroxide, cancer cells, biosensor device

## INTRODUCTION

The localized surface plasmon resonance (LSPR) is the most fascinating and unique property of plasmonic metal nanostructures (gold, silver, copper, etc.) and may be defined by the combined oscillation of electrons in the conduction band, recognized when the frequency of irradiated light is resonant with the normal oscillation frequency of free electrons in metal nanostructures.<sup>1–3</sup> The LSPR in metal nanostructures can either be inhibited by radiative decay through reemission of photons or nonradiative relaxation by the generation of hot carriers (hot electrons and holes) at the nanostructure surface, while the contribution ratio among the two decay mechanisms could be estimated by plasmon mode radiance.<sup>4</sup> The generated hot charge carriers are able either to directly contribute to chemical transformations or to produce local heat. In addition, the higher electric fields with strong electromagnetic fields are also produced at the same time at the surfaces of the nanostructures.<sup>5</sup> Because of this LSPR property, the gold nanostructures can act as probes to convert light energy into localized electric fields or to direct light to a preferred location with nanometer accuracy. Moreover, the incident light can be efficiently operated with extraordinary accuracy through proper control of the nanostructures by means of their size and shape.<sup>6</sup> Thus, the combination of a tremendously localized field with plasmonic hot charge carriers has brought about many potential applications in widely dispersed fields, such as surface-enhanced Raman spectroscopy,<sup>7</sup> biomolecular sens-

ing,<sup>8</sup> single molecular spectroscopy,<sup>9</sup> solar cells,<sup>10</sup> photocatalysis,<sup>11</sup> enzyme-like studies,<sup>12</sup> biomedical engineering,<sup>13</sup> and many others.<sup>14</sup> It has been found that, with LSPR excitation, the photocatalysis process shows a different mode of operation compared to that of normal phonon-driven thermal process and thus offers an unusual family of photochemical conversion. In recent years, several studies have been performed by the LSPR excitation of gold nanoparticles (AuNPs) for photocatalytic degradation,<sup>15</sup> oxidation,<sup>16</sup> dissociation of hydrogen,<sup>17</sup> water splitting,<sup>18</sup> etc. An enhanced catalytic property was achieved because of the strong electromagnetic field generation and greater composition of hot charge carriers due to the absence of any Schottky barriers compared to a semiconductor photocatalyst. The mechanism was investigated using dark-field scattering spectroscopy<sup>19</sup> and surface-enhanced Raman spectroscopy<sup>20</sup> for the LSPR-assisted chemical reactions. It was believed that a larger number of energetic charge carriers are produced by the LSPR excitation on the surface of the nanostructures and would be transferred to the proper orbitals of the adsorbed molecules along with the associated photothermal effect caused via the LSPR excitation and thus resulting enhanced photocatalytic activity.<sup>21</sup>

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## **Viscoelastic blood flow through stenosed artery in the presence of magnetic field**

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**Abstract:** An unsteady analysis of non-Newtonian blood flow under stenotic condition in the presence of a transverse magnetic field has been carried out. The flowing blood is characterised by generalised Oldroyd-B having shear-thinning rheology. The arterial wall is considered to be rigid having cosine shaped stenosis in its lumen. The governing equations of motion accompanied by appropriate choice of the initial and boundary conditions are solved numerically by marker and cell (MAC) method and the results are checked for numerical stability with desired degree of accuracy. The quantitative analysis has been carried out finally which includes the respective profiles of the flow-field. The key factors like the wall shear stress and flow separation are also examined for further qualitative insight into the flow through arterial stenosis. The present results show quite consistency with several existing results in the literature which substantiate sufficiently to validate the applicability of the model under consideration.

**Keywords:** non-Newtonian fluid; stenosis; marker and cell; transverse magnetic field.

**Reference** to this paper should be made as follows: Ikbal, M.A. (2019) 'Viscoelastic blood flow through stenosed artery in the presence of magnetic field', *Int. J. Biomedical Engineering and Technology*, Vol. 30, No. 1, pp.1-15.

**Biographical notes:** Md. Asif Ikbal received his MSc in Applied Mathematics from the Visva Bharati University, India in 1998 and awarded PhD from the same university in 2011. Presently, he is an Assistant Professor at the Khatra Adibasi Mahavidyalaya, Khatra, W.B., India. His areas of research interest are biofluid dynamics and computational fluid dynamics. He has published six research articles in journals of international repute. He has acted as a reviewer in various international journals.

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### **1 Background**

Hemodynamics has long been suspected of being involved atherosclerotic lesions causing the normal flow disturbances around those specific sites where plaques are frequently formed. Although it has been found that low and oscillatory wall shear stresses are often positively correlated to localised intimal thickening of the arterial wall but the

## GITHA HARIHARAN'S WHEN DREAMS TRAVEL AS PASTICHE

UJJWAL BISWAS

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MAHAVIDYALAYA, KHATRA, BANKUKA, (W.B.)

### ABSTRACT

Githa Hariharan has employed the postmodern technique pastiche in *When Dreams Travel* to point out the misrepresentation of women in cultural representations. Patriarchal power which had been believed from ancient times is proved wrong through the technique of pastiche. Githa Hariharan has used the historical Arabic folklore collections, *The Thousand and One Nights* well known as *The Arabian Nights* as an element of pastiche in *When Dreams Travel*. The women characters Shahrzad and Dunyazad who were minor characters in the *The Arabian Nights* are cast as the protagonist in *When Dreams Travel* as an attempt to revision the existing text from a feminist perspective. Indian folklore and myth are used as pastiche through the character Dilshad and Satyasama. By revisioning these myths, Githa Hariharan has attempted to subvert the principles of patriarchy which were entrenched in the male centered narratives of the past.

**Keywords:** Githa Hariharan, *When Dreams Travel*, Pastiche, Postmodern technique.

Pastiche is a postmodern technique which means to combine, or paste together, multiple elements. Pastiche is employed by Githa Hariharan as a representation of the chaotic, pluralistic aspects of postmodern concept. It is also considered as a unique narrative technique that comprises of multiple genres to comment on postmodern situations. The mere limitation of Pastiche from that of Parody is that Pastiche has no place for humour or satire but it tends to imitate other texts. Hariharan has included the art of storytelling as an element of pastiche. Frederic Jameson in a conversation with Anders Stephanson explains the term "difference" in a narrative discourse as:

I tried to put this in the slogan "difference relates." The very perception of breaks and difference becomes a meaning in itself; yet not a meaning that has content but one that seems to be a meaningful, yet new, form of unity. This kind of view does not pose the problem "How do we relate those things; how do we turn those things back into

# A Philosophical Study on the Concept of Humanism

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## Abstract

Humanism is an aspect of moral philosophy. It rests faith in the dignity and worth of all men. It believes in universal human qualities, particularly in human rationality. Humanism does not admit parochialism, nor does it admit any supernatural or divine personality. It believes that truth can be discovered by human efforts. It considers the welfare of humankind. In this paper, I tried to expose the salient features of humanism and conclude accordingly.

**Keywords:** Humanism, Humanist, Philosophy, Human.

## Introduction

The great Indian ancient poet Chandi das once said: "Sabar upare manus satya tahar upare nai". i.e. – man is the only truth; there is no truth over him or other than him. This very attitude forebears the germ of Humanism. It may, therefore, be held. "Humanism is the opposite to fanaticism, regions, intolerance, and disrespect for the views and knowledge of others. One of the basic trends of humanism is the freedom of the individual. A humanist, therefore, is one who believes in the dignity and autonomy of man. He is averse to advocating man as dependent on any being - be it god or any other supernatural power. He regards man to be the master and the pivot around which the world revolves".

It is commonly believed that humanism as a philosophical worldview has its impetus with Protagoras's dictum - "man is the measure of all things". But this claim is not widely adhered to. A group of thinkers differs in this regard. They hold, "But this pronouncement was as startling as it became too misleading almost immediately after it was made. The centrality of human interest and of human well-being that underlies the Protagorean dictum was soon to be drowned in subjectivism and individualism".

However, the concern for man and the central significance of the human point of view could never be overlooked. Human ideals, human values received the most care and most importance both in Indian and western philosophy from their inception. "Buddha's stress on the here and now, Mimamsakas vision of the purusartha as pursuable Ayam, Kant's

## Sanskrit Education through Multimedia Technology

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### Abstract: -

In Teaching and learning communication abilities, we have a great deal to browse the universe of innovation: TV, CD Rom, Computers, C.A.L.L., the Internet, Electronic Dictionary, Email, Blogs and Audio Cassettes, Power Point, Videos, DVD's or VCD's. The most recent two decades have seen an upheaval because of beginning of innovation, and has changed the elements of educational organizations, and has additionally affected the educational framework and the manner in which individuals' interface and work in the general public. This fast rising and improvement of data innovation has offered a superior example to investigate the new educating model. Utilizing multimedia to make a setting to instruct communication expertise has its one-of-a-kind favourable circumstance. Subsequently innovation assumes a significant job in showing communication expertise. This paper attempts to break down the need of multimedia innovation to communication ability instructing and furthermore draws out the issues looked by utilizing these advancements. It likewise means to make English instructors mindful of the techniques to utilize it in a powerful way. In the present situation of educational organizations, multimedia has uncovered its own sort of room in a few or the other route as an instrument of educational innovation. Multimedia has beaten the hindrances of existence and gives proof to be acknowledged as a whenever and anyplace device for instructing multi-disciplinary masses. The procedure of information procurement turns out to be progressively proficient when the students experience an occasion through a multimedia reproduction. Multimedia innovation enables the educational procedure by methods for expanded collaboration among instructors and the understudies. Aside from the way that multimedia can furnish instructors and understudies with unlimited conceivable outcomes of value educating and getting the hang of, taking fundamental contemplations of the academic qualities and impediments of Multimedia, it tends to be utilized to its fullest power, and achieve the distinction of 'New Educational Technology apparatus.

**Keywords:** Communication skill teaching, Multimedia Technology, Advantages, Disadvantages, Optimization, Strategies.

### Introduction

This paper displays an exhaustive investigation of chose papers that are relevant to the utilization of Multimedia in Education, just as records down the different proposed multi-



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## Summary Sheet corresponding to Excel Template 3.3.1 (2018)

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# AgInS<sub>2</sub>-Coated Upconversion Nanoparticle as a Photocatalyst for Near-Infrared Light-Activated Photodynamic Therapy of Cancer Cells

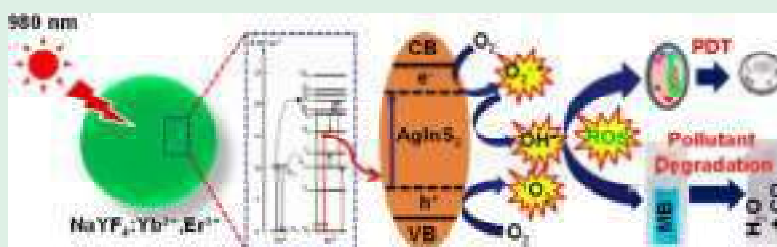
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## Supporting Information



**ABSTRACT:** The development of high-performance near-infrared (NIR) photocatalysts with long-term stability and the elucidation on the working mechanism along with multifunctional activity toward biomedical applications have not been explored sufficiently. Herein, a novel hybrid material of an upconversion nanoparticle (NaYF<sub>4</sub>/Yb<sup>3+</sup>,Er<sup>3+</sup>) (UCN) coated with a ternary semiconductor (AgInS<sub>2</sub>, AIS) has been synthesized by a simple and robust two-step solvothermal route for NIR light active photocatalysis. Preparation of oleic acid-capped spherical UC nanoparticles (NPs) (~25 nm) followed by solvothermal decomposition of two precursor complexes Ag(acda) and In(acda)<sub>3</sub> resulted in the formation of well-defined NaYF<sub>4</sub>/Yb<sup>3+</sup>,Er<sup>3+</sup>@AgInS<sub>2</sub> core-shell nanoparticles (UCN@AIS NPs) (~90 nm). It has been found that effective energy transfer occurred from NaYF<sub>4</sub>/Yb<sup>3+</sup>,Er<sup>3+</sup> to AgInS<sub>2</sub> by a nonradiative luminescence resonance energy transfer process. Superior photocatalytic decomposition activity was validated in terms of the degradation of methylene blue dye under the exposure of 980 nm NIR laser light with the presence of a UCN@AIS NP catalyst. The degradation process was mediated primarily owing to the formation of a cytotoxic reactive oxygen species (ROS) by the hybrid material under NIR light irradiation, in which UCN performs as a transducer to sensitize AIS and trigger the ROS generation. In vitro cancer cell imaging potentiality of the UCN@AIS NPs was then studied on cervical cancer cells (HeLa cells). The UCN@AIS NPs induced in vitro cervical cancer cell death (photodynamic therapy) with ~27% efficiency as measured by the MTT assay and thus proved to be a decent candidate for NIR active photocatalysts for biomedical applications.

**KEYWORDS:** upconversion nanoparticle, ternary semiconductor (AgInS<sub>2</sub>), near-infrared photocatalysis, photodynamic therapy, bioimaging

## INTRODUCTION

Solar light-driven generation of cytotoxic reactive oxygen species (ROS) [superoxide radical anion (O<sub>2</sub><sup>•-</sup>), hydroxyl radicals (•OH), and singlet oxygen (<sup>1</sup>O<sub>2</sub>)] from the photosensitizer is an effective and fascinating approach for the degradation of environmental organic pollutants from wastewater.<sup>1–3</sup> Meanwhile, light-driven effective killing of cancerous cells, which is commonly known as photodynamic therapy (PDT) driven by generated cytotoxic ROS, has attracted enormous attention due to lesser side effects and minimal systemic toxicity compared to the traditional chemotherapy and radiation therapy. Thus, PDT has been considered as an emerging and pioneering cancer therapeutic modality.<sup>4–6</sup> Although, the UV–visible light harvested photocatalysts are

the promising candidates for toxic organic chemicals redemption; however, their use in biomedical science is greatly hindered due to a low penetration depth in tissue sites.<sup>7</sup> Thus, it is intentionally appreciable to tune the optical exposure to the biological NIR window (700–1000 nm) region.<sup>8</sup> Besides, the commonly used organic photosensitizers for PDT, like Ce6, ZnPc, ICG, etc., are experiencing difficulties of photobleaching, stability, as well as quick circulation in body and, therefore, further hinders their biomedical applications.<sup>9,10</sup> In this context, inorganic semiconductor photocatalysts are one of

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# Synergistic Nanozymetic Activity of Hybrid Gold Bipyramid–Molybdenum Disulfide Core@Shell Nanostructures for Two-Photon Imaging and Anticancer Therapy

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## Supporting Information

**ABSTRACT:** In recent years, the concept of combined therapy using gold hybrid nanomaterials has been broadly adopted to pioneer new anticancer treatments. However, their synergistic anticancer effects have yet to be thoroughly investigated. Herein, a hybrid gold nanobipyramid nanostructure coated with molybdenum disulfide ( $\text{MoS}_2$ ) semiconductor ( $\text{AuNBPs}@ \text{MoS}_2$ ) was proposed as a smart nanozyme for anticancer therapy and two-photon bioimaging. The hybrid material showed dramatically enhanced localized surface plasmon resonance property under excitation owing to its anisotropic nature, coupled with the rich electron density in  $\text{MoS}_2$ , resulting in the superior in situ photogeneration of reactive oxidative species (ROS -  $^1\text{O}_2$ ,  $\cdot\text{OH}$ ). We demonstrated that the synergistic effect of enhanced photothermal conversion and generation of ROS could increase the anticancer effect of  $\text{AuNBPs}@ \text{MoS}_2$ . Two-photon luminescence imaging confirmed that  $\text{AuNBPs}@ \text{MoS}_2$  was successfully internalized in cancer cells and that simultaneous anticancer treatments based on catalytic and photothermal therapy could be achieved. This study highlighted, for the first time, a novel approach of plasmon-mediated powerful anticancer therapy and imaging via the unprecedented combination of anisotropic AuNBPs and two-dimensional  $\text{MoS}_2$  material.

**KEYWORDS:** localized surface plasmon resonance, gold nanobipyramid, photodynamic therapy, photothermal therapy, two-photon imaging



## INTRODUCTION

Over the past few years, molybdenum disulfide ( $\text{MoS}_2$ ), a two-dimensional (2D) transition-metal dichalcogenide nanomaterial, has attracted distinct attention beyond graphene, because of its unique optical, electronic, and mechanical properties.<sup>1–3</sup> Two-dimensional  $\text{MoS}_2$  nanosheets (NSs) have shown significant promise in a wide range of fields including electronic devices, transistors, energy storage devices, and catalysis.<sup>4–6</sup> Very recently, 2D  $\text{MoS}_2$  nanosheets have also come to be considered as an emerging class of nanomaterials for various biomedical applications, such as DNA biosensors, blood glucose detection, antibacterial agents, NIR photothermal agents, and drug delivery with excellent biocompatibility and low toxicity in living organisms.<sup>1,7–10</sup> In addition, the  $\text{MoS}_2$  NSs could also perform as artificial enzymes, with so-called peroxidase-like activity (POD) for the highly sensitive

and selective colorimetric detection for  $\text{H}_2\text{O}_2$  and glucose in serum.<sup>11–14</sup> In order to further achieve improved performance through synergistic effects, attempts have been made to decorate/combine  $\text{MoS}_2$  NSs with other effective materials, such as, metal chalcogenides,<sup>15</sup> carbon nanomaterials,<sup>16</sup> metal oxides,<sup>17</sup> noble metals,<sup>18</sup> and so on. Between all of these techniques, the decoration of metal nanostructures (Au, Ag, and Pt) with their unique surface plasmon resonances to the semiconductor  $\text{MoS}_2$  NSs are considered to be impressive candidates for hybrid nanostructures.<sup>19,20</sup> Over the past several decades, gold nanocrystals (Au NCs) have been investigated extensively due to their pronounced prospective applications in

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## **A PHILOSOPHICAL STUDY ON CULTURAL CONFLICTS AND CULTURAL IDENTITY**

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### **Abstract**

The present study is highly interdisciplinary in character. It consists of insights from different disciplines and draws its common legacy from a variety of epistemological approaches that are originated in the humanities, social sciences, as well as in the different philosophical schools of thought such as analytical philosophy and phenomenology and intends to comprehend the notions of cultural conflict and social harmony from a critical-creative perspective in order to determine the place of the human subject in a given cultural tradition. To find out the socio-economic and cultural conditions that foster social conflicts. Culture transfer is a transfer of certain institutions, education institutions, and cultural goods such as science and art which has been only partially taken place in the colonization process. Cultural ideals, life forms and cultural ambience can be transferred, but it is not yet clear how far globalization processes will be successful in this area. For many years culture transfer was based on the ideology of the western cultural superiority. Another specific purport of this project is to inquire whether cultural groups can act as agents of profound transformation.

**Keywords:** Culture, Identity, Conflicts, philosophy

### **Introduction**

It is very difficult or rather impossible to give an exact definition of culture. Let us take an example Love. It cannot be explained in any words since it is an experience and belongs to us which surrounds and shows the connection with the whole expanse of life which is around us. It is so different and unique in itself therefore to give it a definition is out of question

When we speak of a cultured man, cultured behavior, a thorough gentleman, thereby we mean that a person has a refined taste and is often associated with having good qualities. Culture in other words can also mean to understand what his status in the world is therefore it