



Funded  
by the  
National  
Science  
Foundation

**Annual PREM-PI Meeting, May 20<sup>th</sup>, 2013**

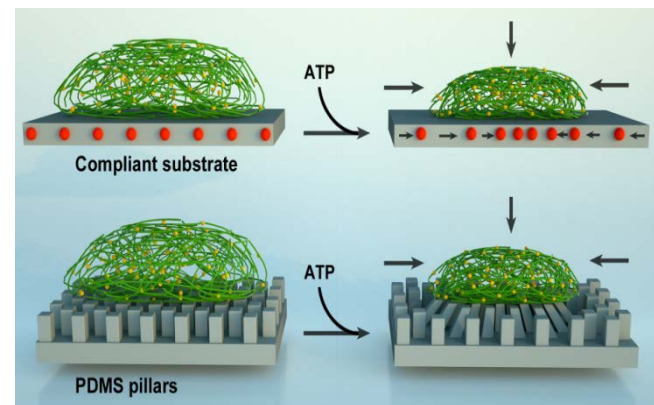
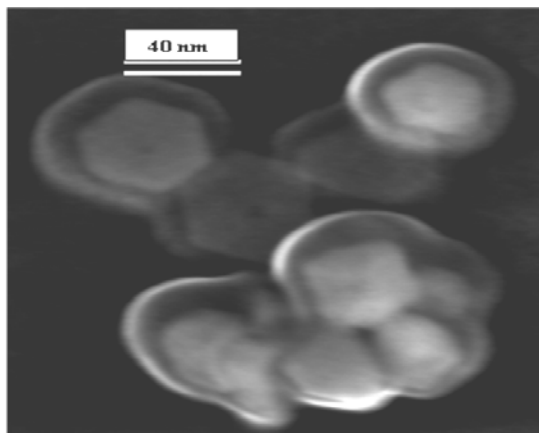
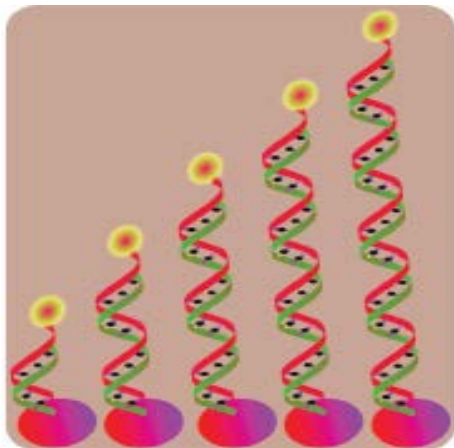
**Multifunctional Nanomaterial:  
JSU-UCSB PREM**

**Paresh Chandra Ray and other  
PREM Members**

**Department of Chemistry, Jackson State University, Jackson, MS, USA**



# JSU-UCSB Partnership for Research and Education in Material Science



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# PREM Faculty MEMBERS

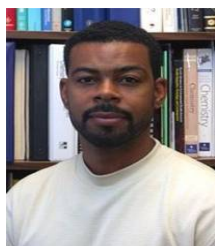


**Program Director (PD)**

**Ray**



**Jerzy**



**Ashton**



**Yu**



**Hawker**



**Pak**



**Ram**



**Gao**



**Hill**



**Quinton**



**Valentine**



**Fygenson**



**Jaeger**



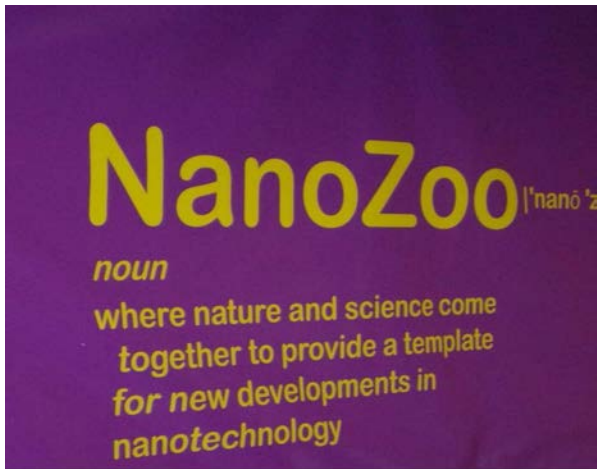
**Nguyen**

**JSU Team Members**

**UCSB Team Members**



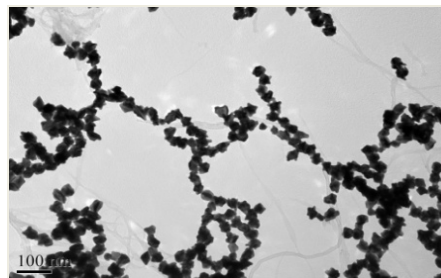
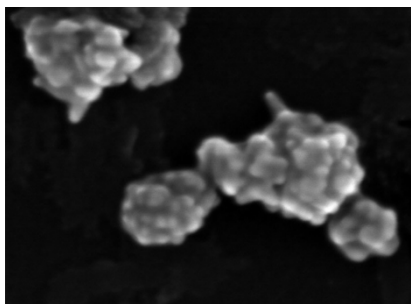
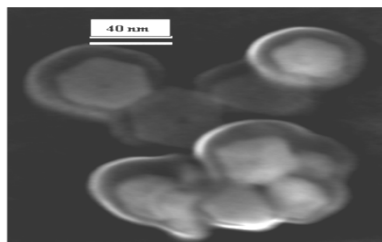
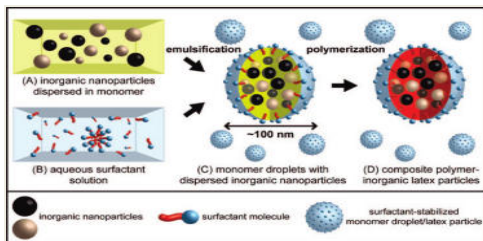
**Our mission:** To foster collaborative, interdisciplinary research and education in the areas of Multifunctional Nanostructured material and Mechanically-Active Hybrid Biomolecular Gels that will address the future needs of society and will increase the participation of minorities in material science research and education.



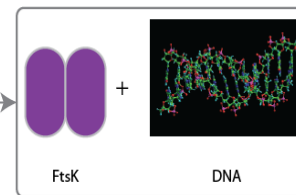
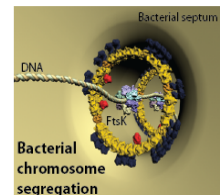
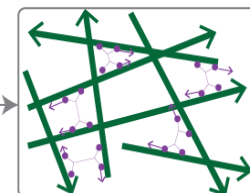
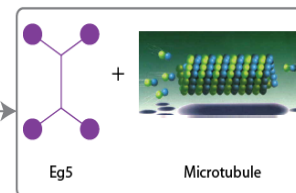
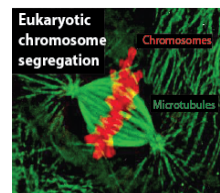
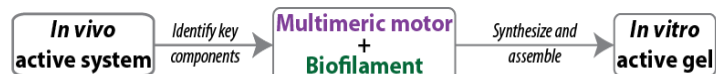
# Goal and Objectives



## Education of next generation material scientists



**Multifunctional Nanostructured material**



**Mechanically-Active Hybrid Biomolecular Gels**



# PREM is central to JSU becoming a leader in Materials Research

## 18 Publications in Last One Year

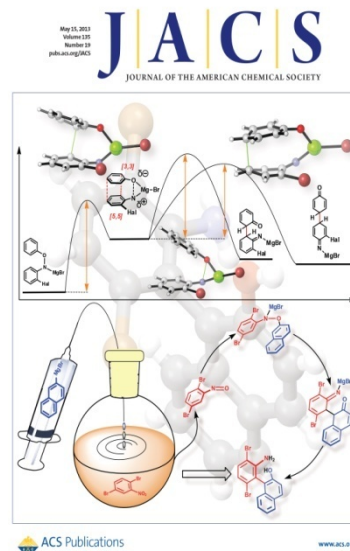


**Impact Factor 11.4**

Chem Soc Rev

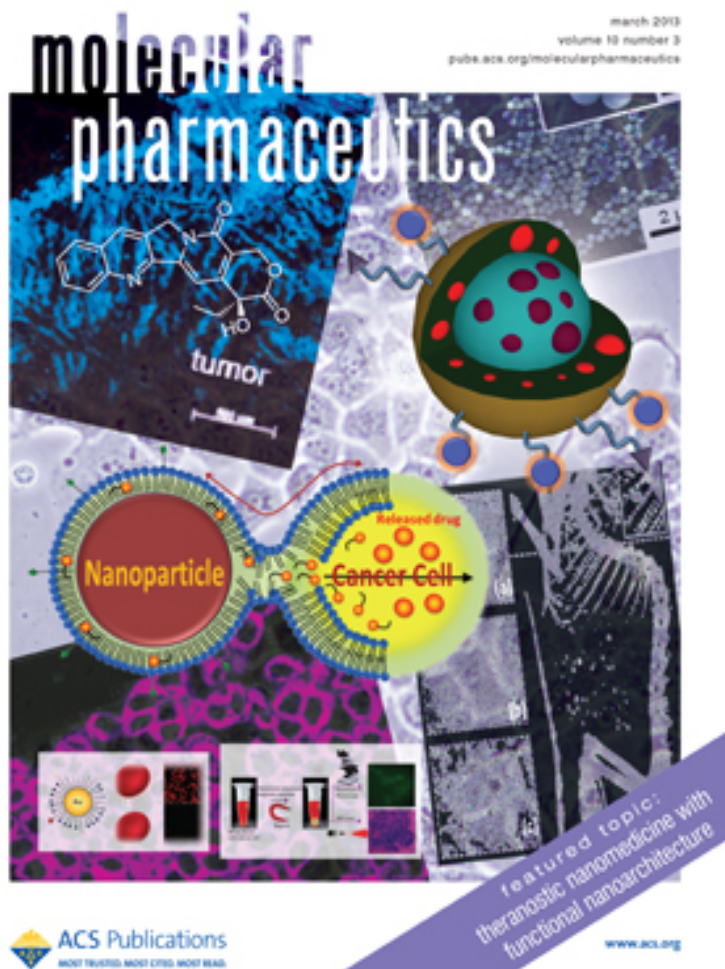
- Impact factor 28.76
- 24 issues / year
- Indexed in MEDLINE

**Impact Factor 28.76**



**Impact Factor 9.9**

# Cover Page in ACS Molecular Pharmaceutics Journal March, 2013 Issue



# **PREM Catalysed Institutional Research Direction**

## **Center Type Funded Projects**

**NSF-REU Grant on “Environmental Nanotechnology”, Started Sept., 2012**

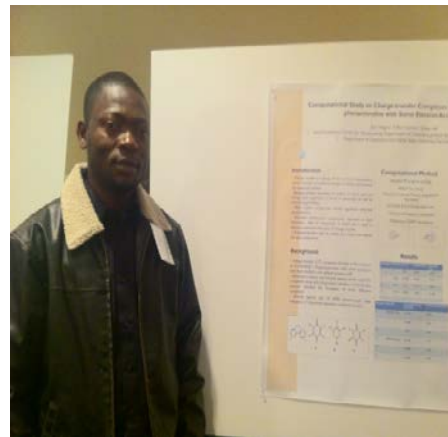
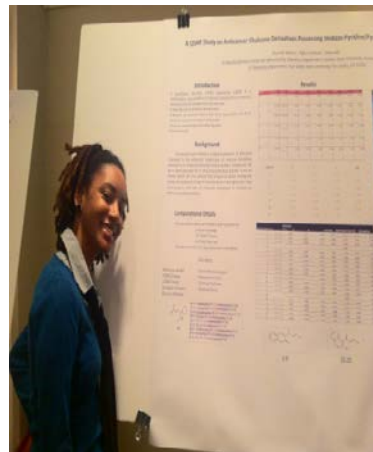


## **Funded Personal Projects**

## **NIH-R21, AFOSR, ARL**

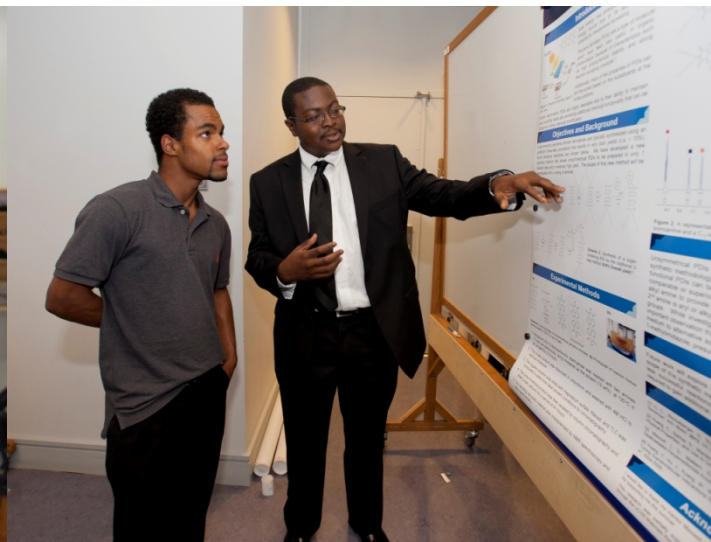


# Minority students are engaged in cutting edge research



**9 graduate students, 7 undergraduate students and 8 high school students involves in PREM research in last one year.**

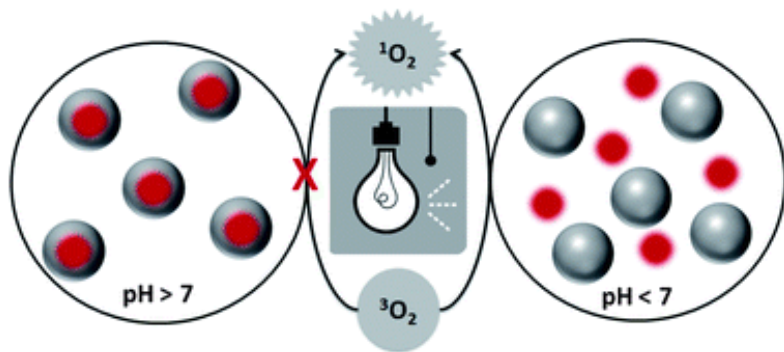
# PREM Helps JSU Minority Students to Participate in World Class Material research at UCSB



Zachery Glenn  
Brandon Newton  
Shawnta D. Woods  
Amber Johnson



# PREM Helps Local American K12 Participants to Join in Summer Research at JSU



Published in *J. Mater. Chem.*, 2012,22, 12701-12708, where K12 participants are Co-authors



# PREM Annual Conference in JSU



Dennis Hess

Kirk Schanze

Oleg Shyshkin

Gang Lu

Andrzej Wierzbicki



Student Presenter-Christopher Copeland



Student Poster Winner - Jerell Harwell

# Nanoday Activity at Memphis Zoo



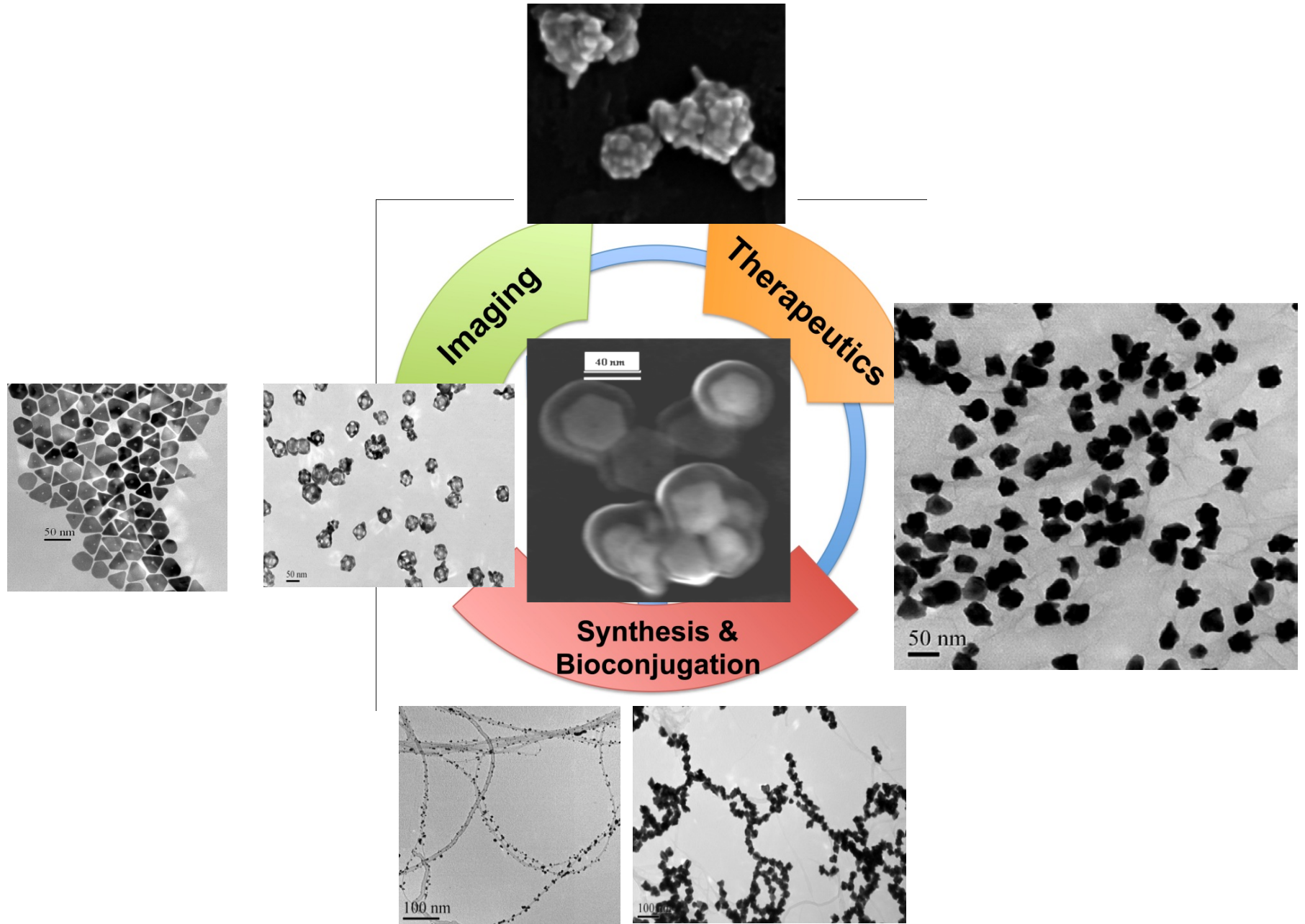
**NanoZoo** <sup>/'nanō 'zoo</sup>  
*noun*  
where nature and science come together to provide a template for new developments in nanotechnology



MEGA thanks for an awesome NANO event! We couldn't have done it without you! Becky, Carla, Karen, Laura & Leslie!

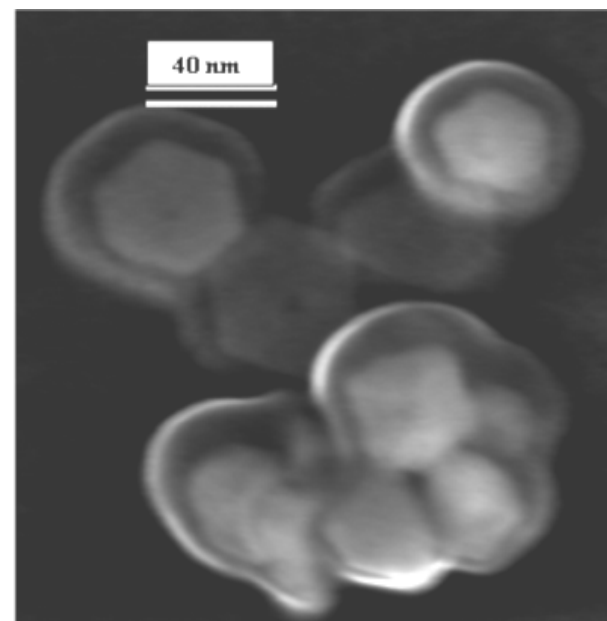
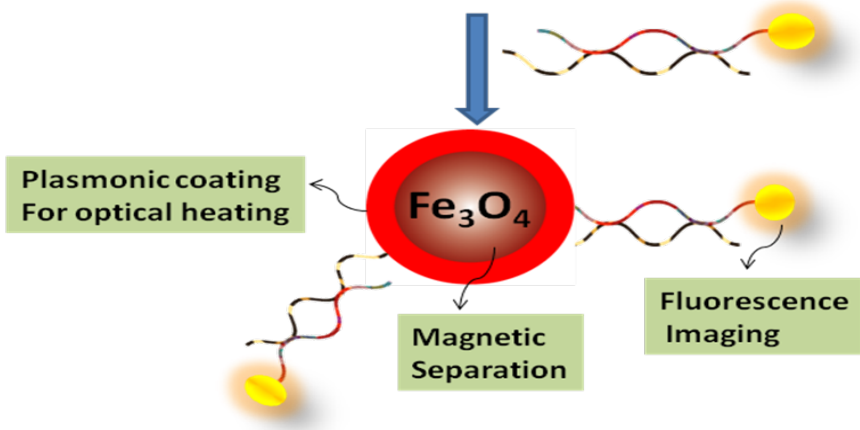
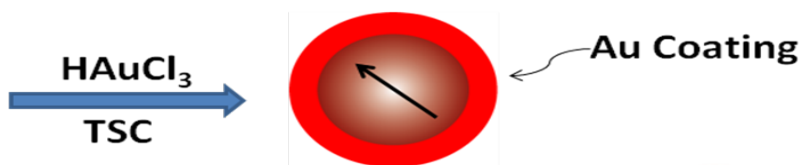


# Multifunctional Material



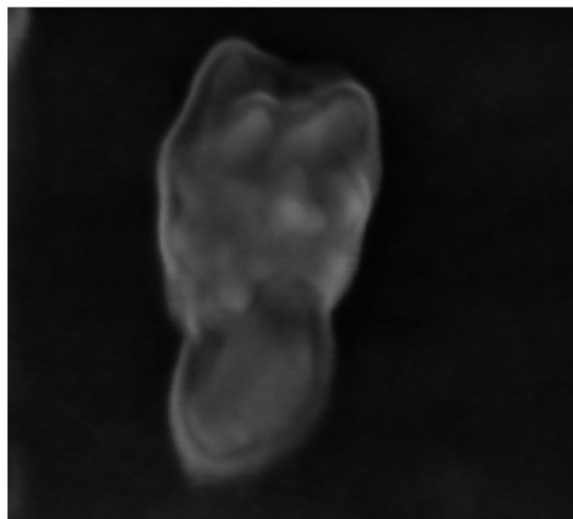
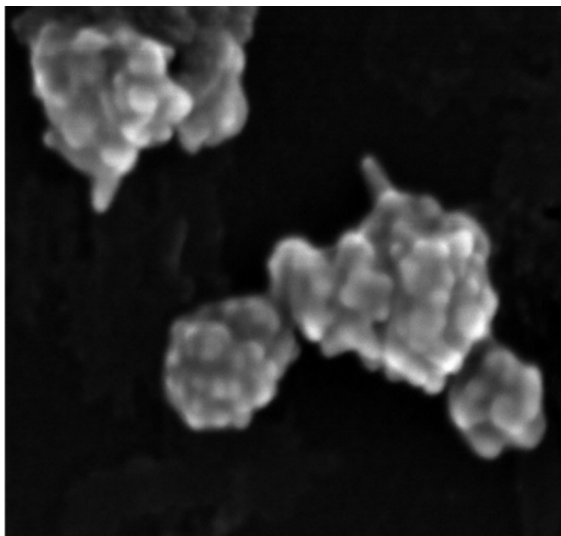
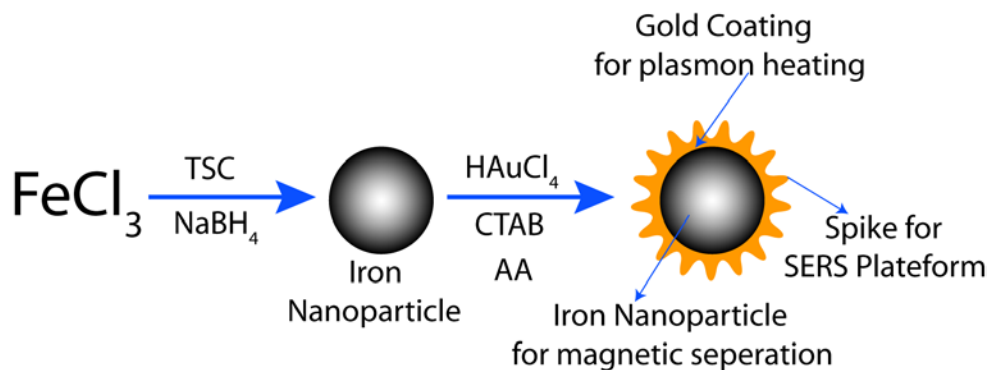


# Multifunctional Plasmonic Shell-Magnetic Core Nanoparticles



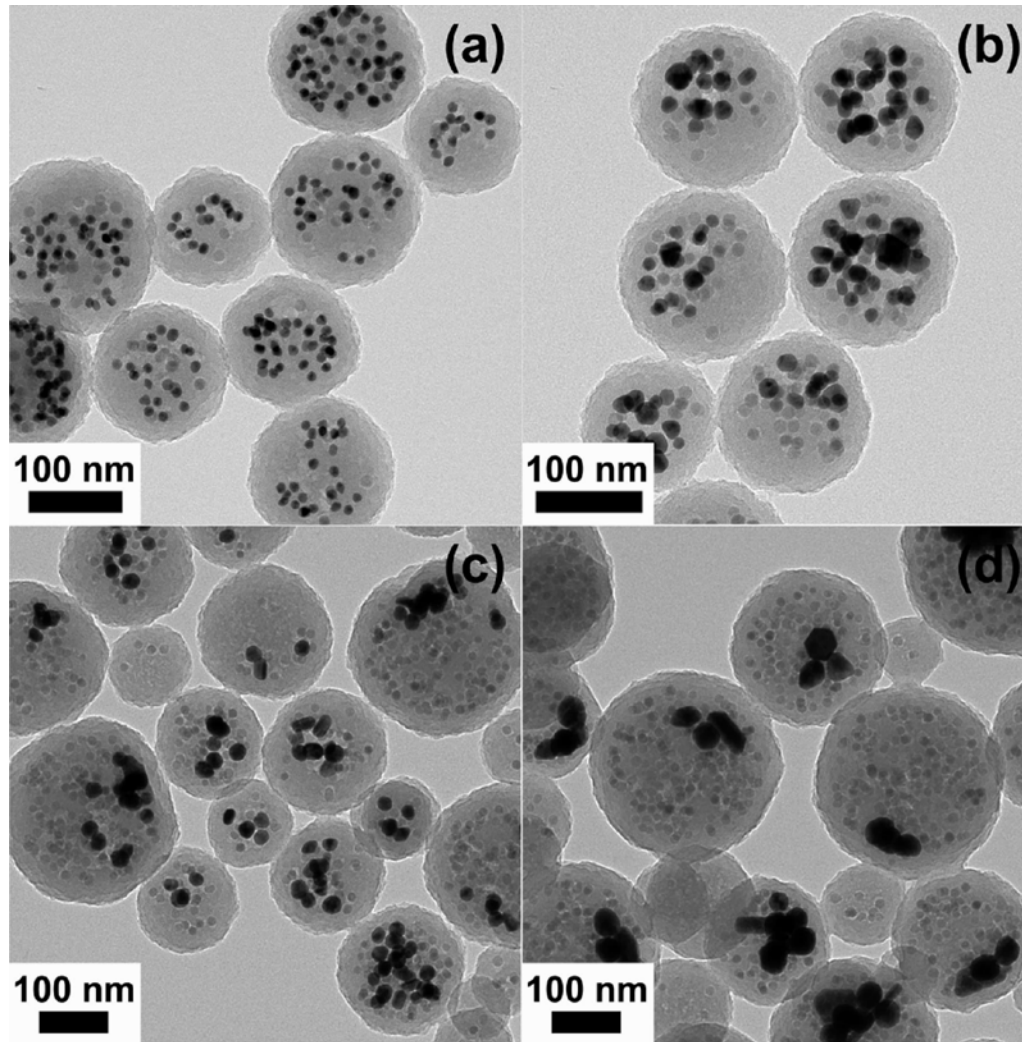
*ACS Nano*, 2012, 6,1065–1073

# Popcorn Shape Magnetic Core–Plasmonic Shell Multifunctional Nanoparticle



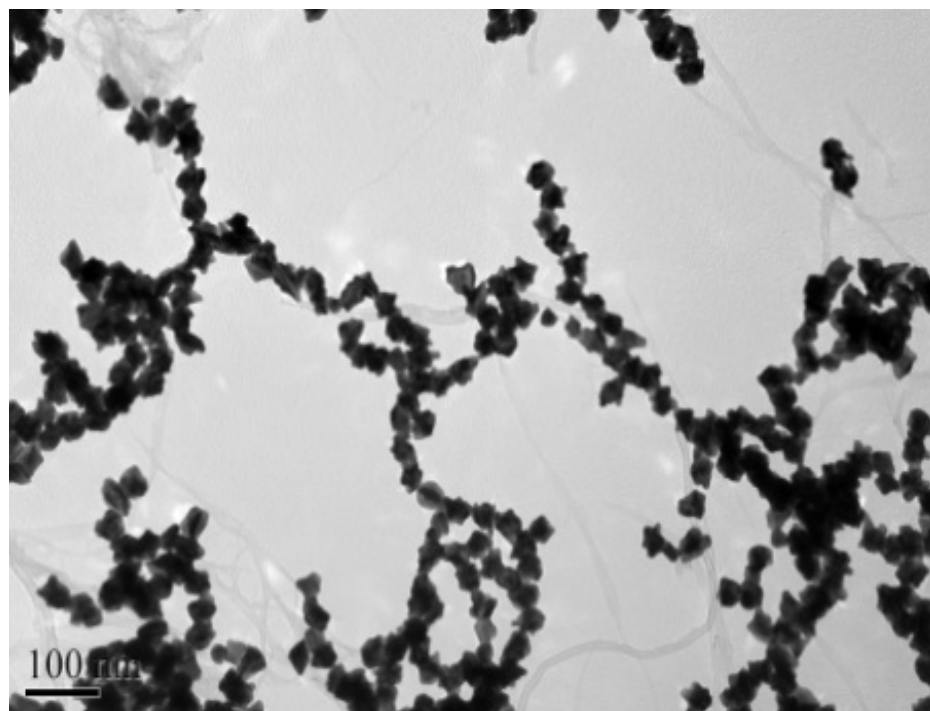
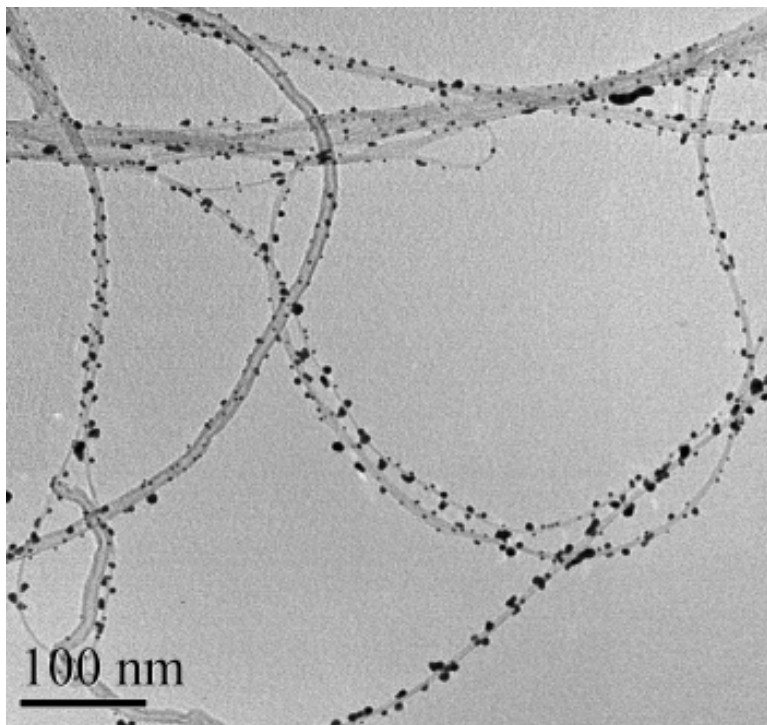
*Chem. A. Eur. J.* 2013, 19, 2839-2847

# Multifunctional Gold Polymer Nanotechnology



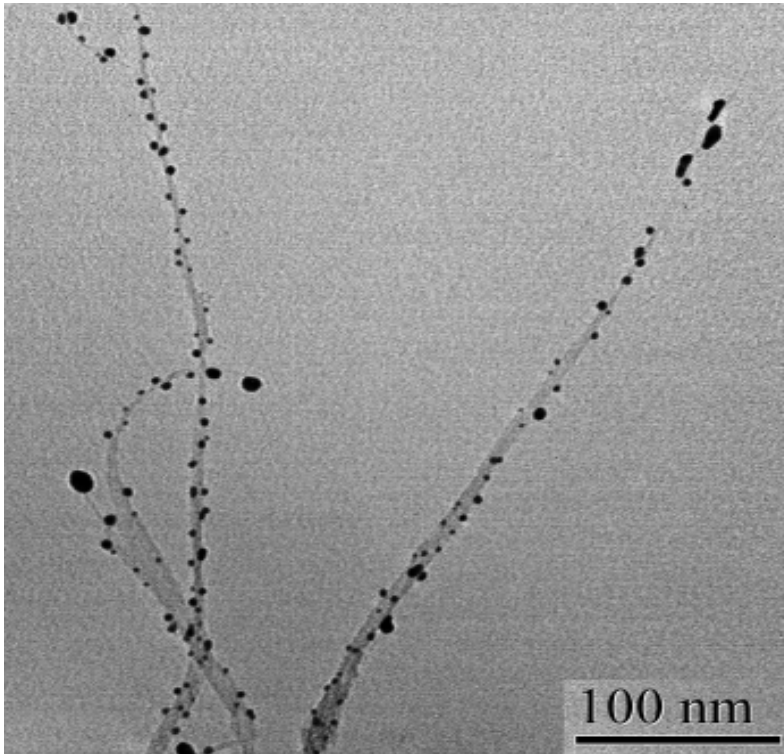


# Multifunctional GNP functionalized CNT

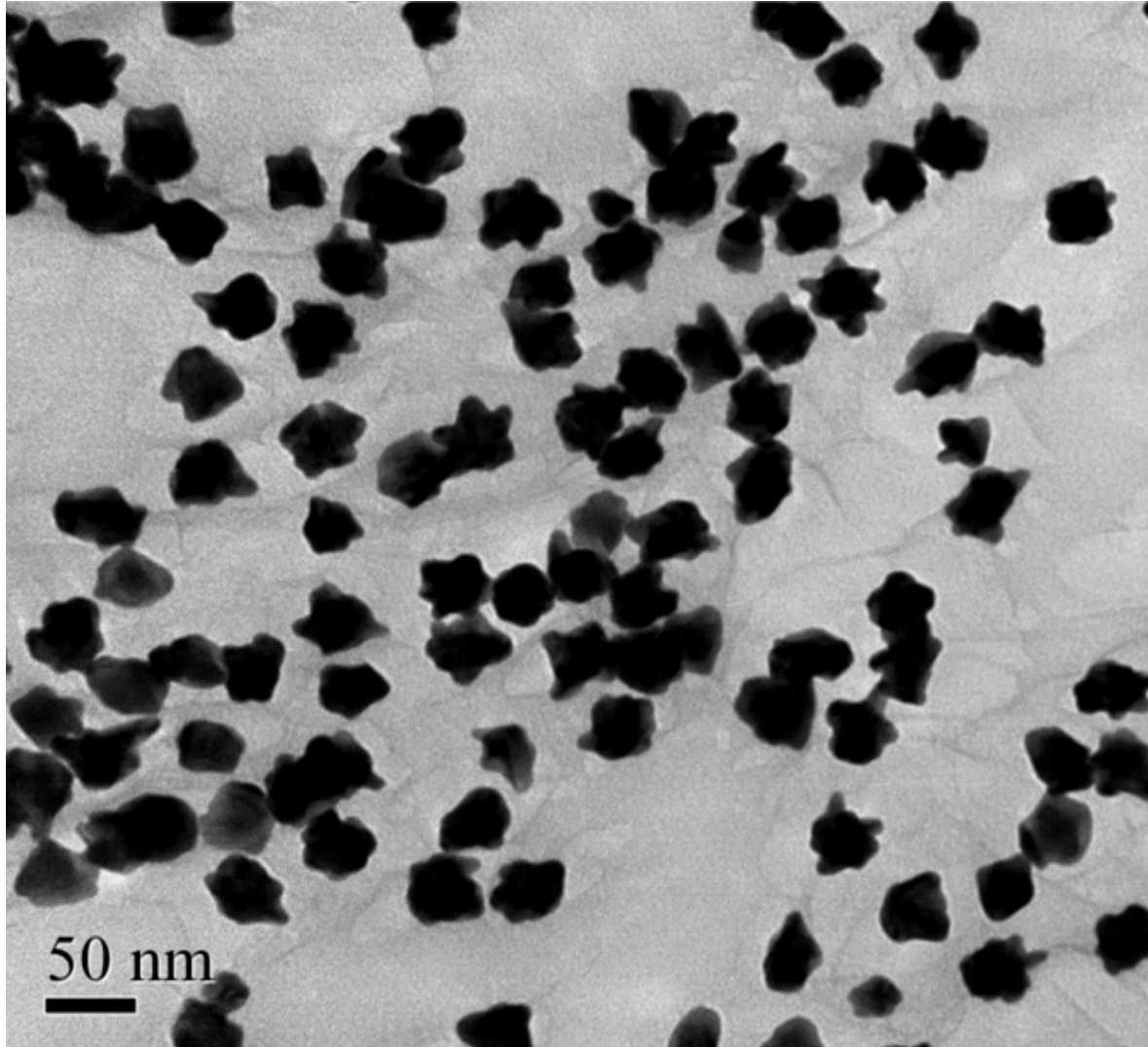


*Chem. Commun.*, 2012,**48**, 6711-6713

# Multifunctional Magnetic CNT

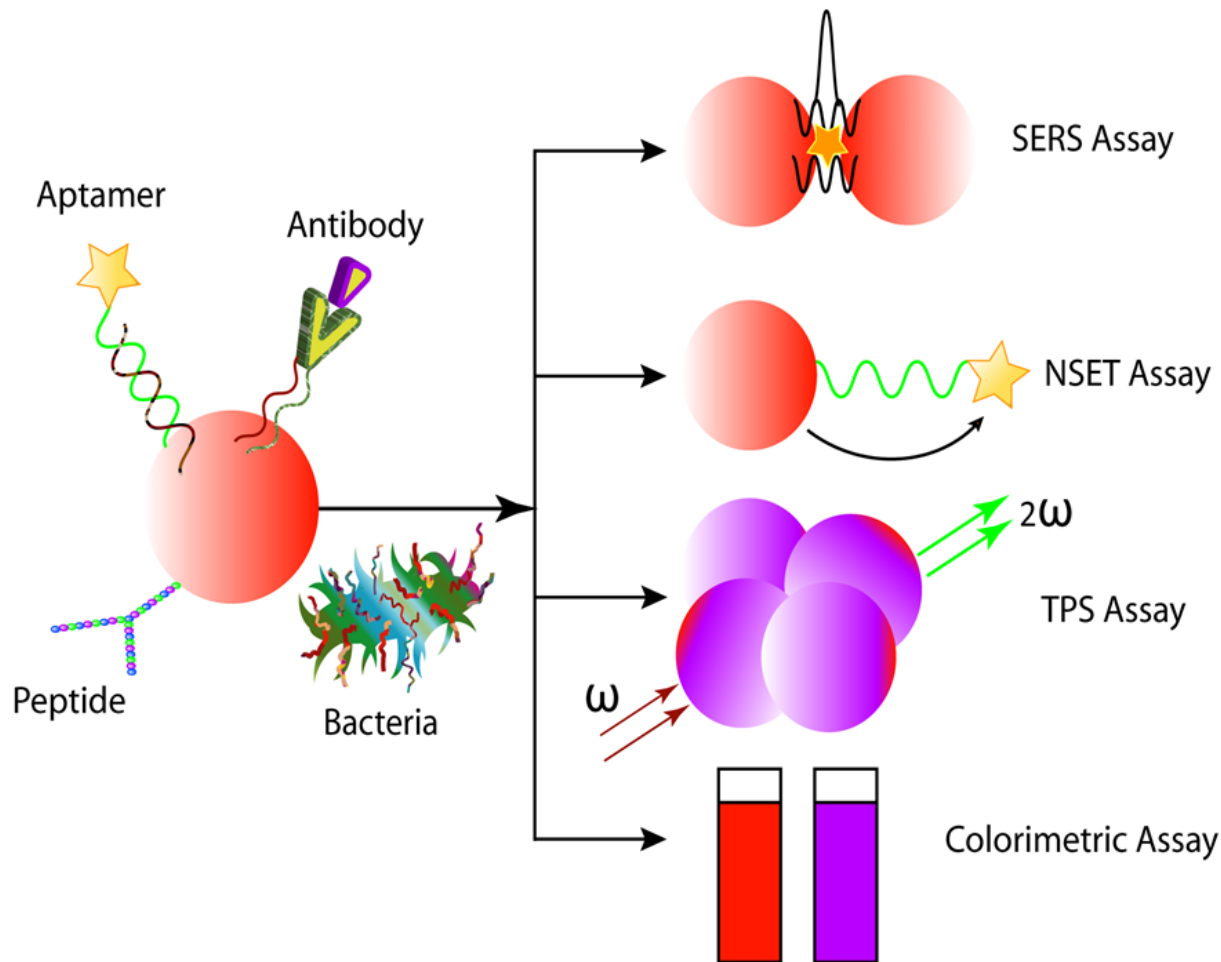


# Multifunctional Plasmonic Graphene Oxide



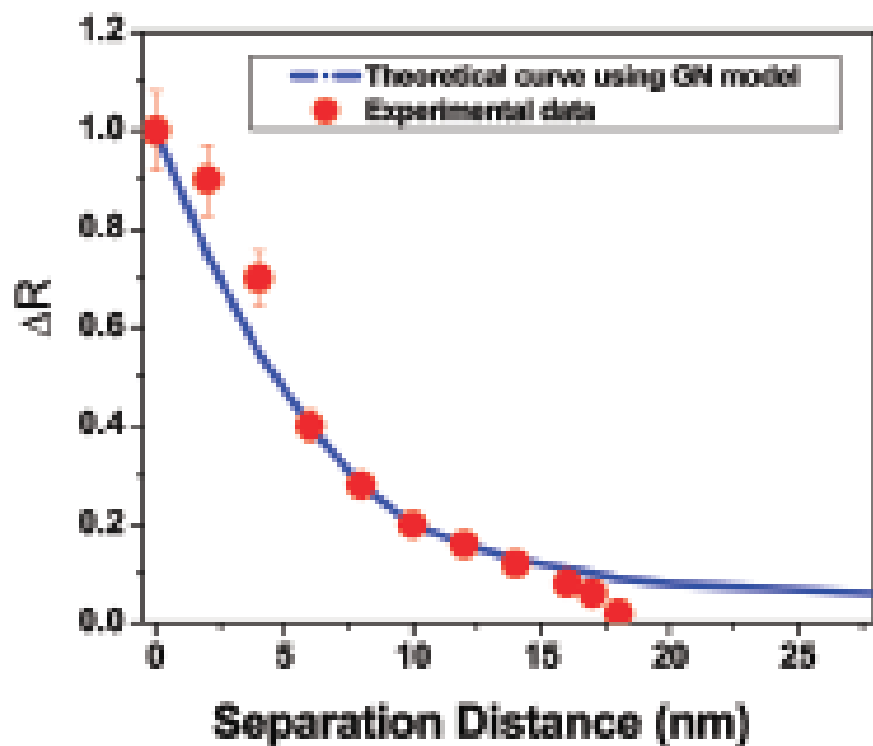
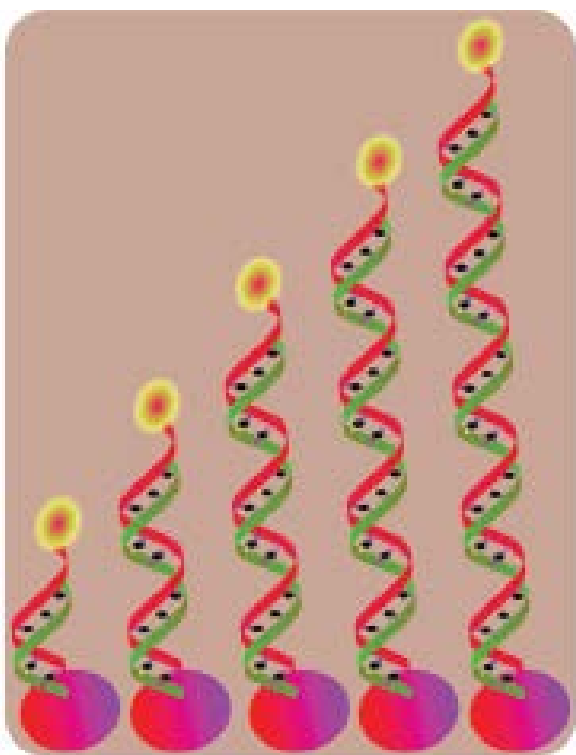


# Selective Imaging Scheme



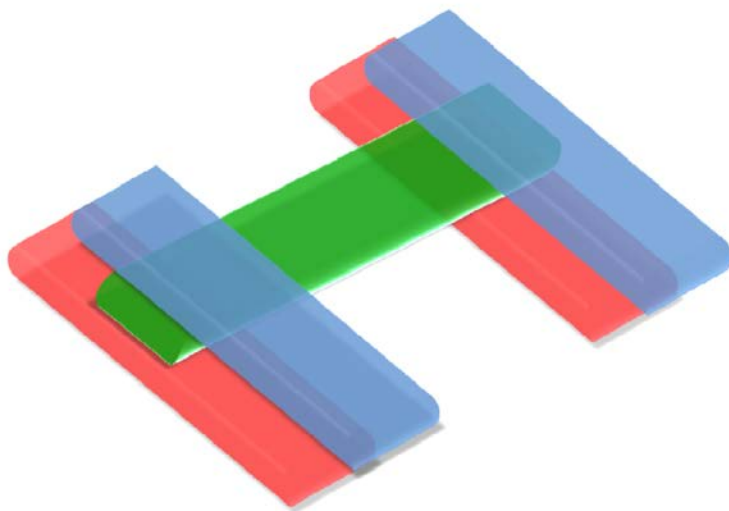
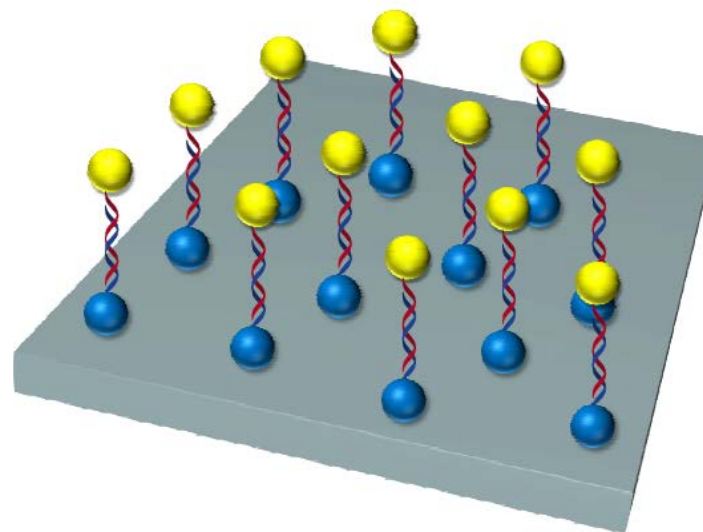
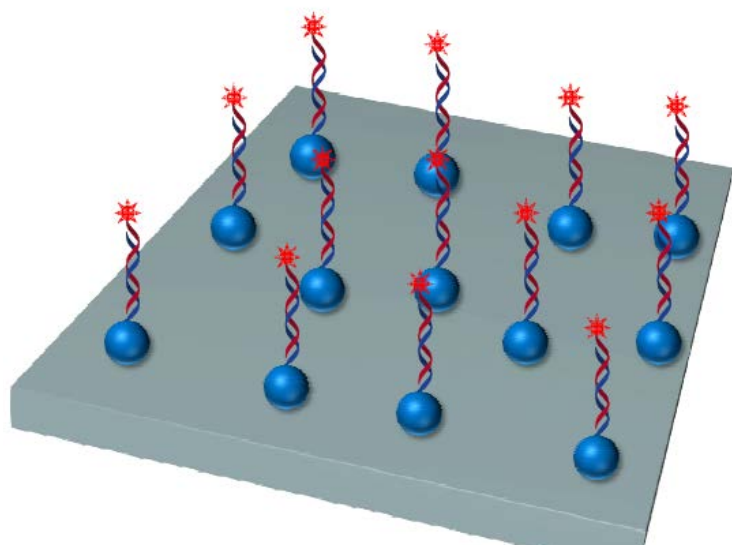
*Chemical Society Review*, 2012, 41, 3193-3209

# Long Range SERS Ruler



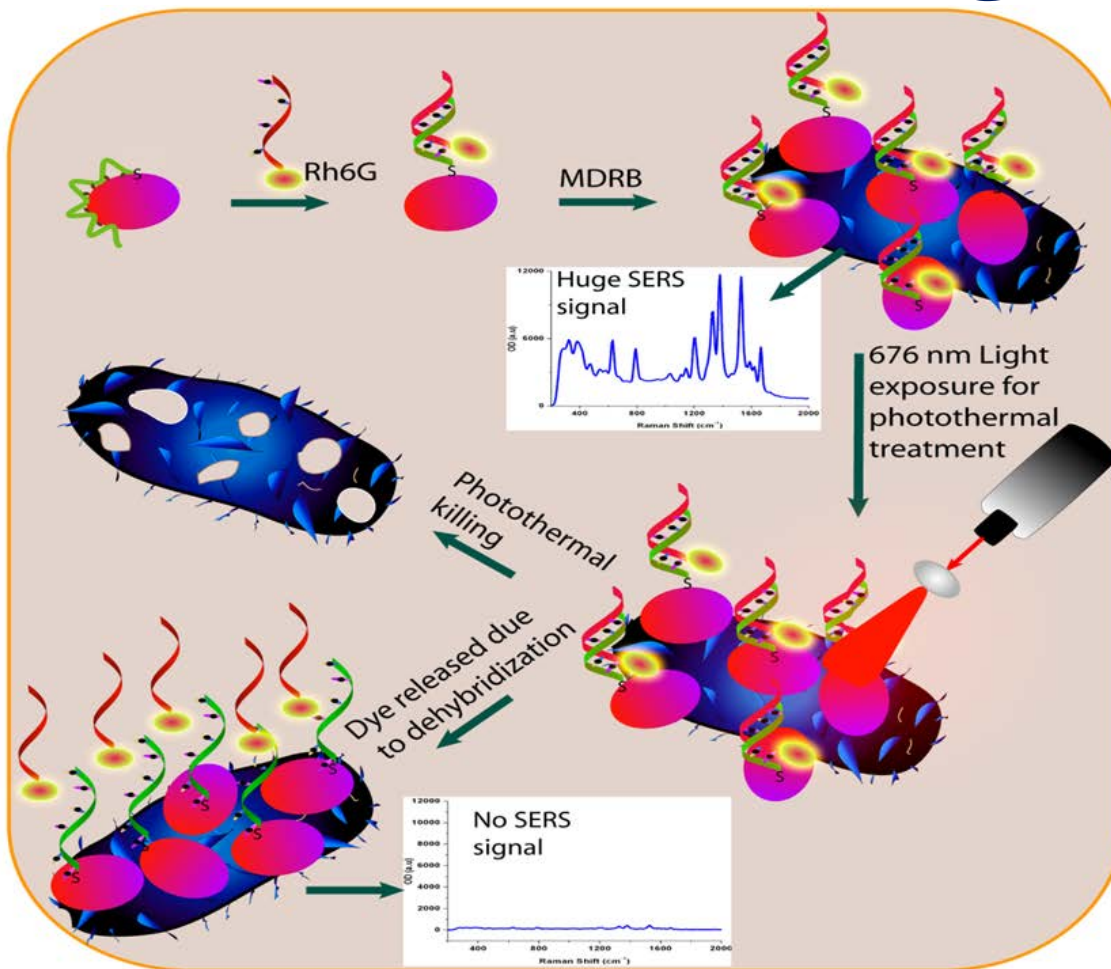
**J. Am. Chem. Soc., 2012, 134, 8662–8669**

# Long Range NSET Ruler



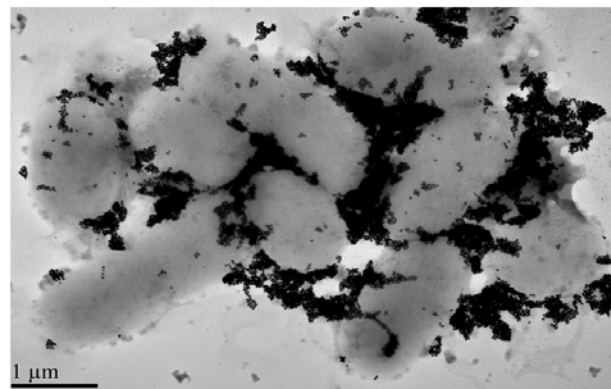
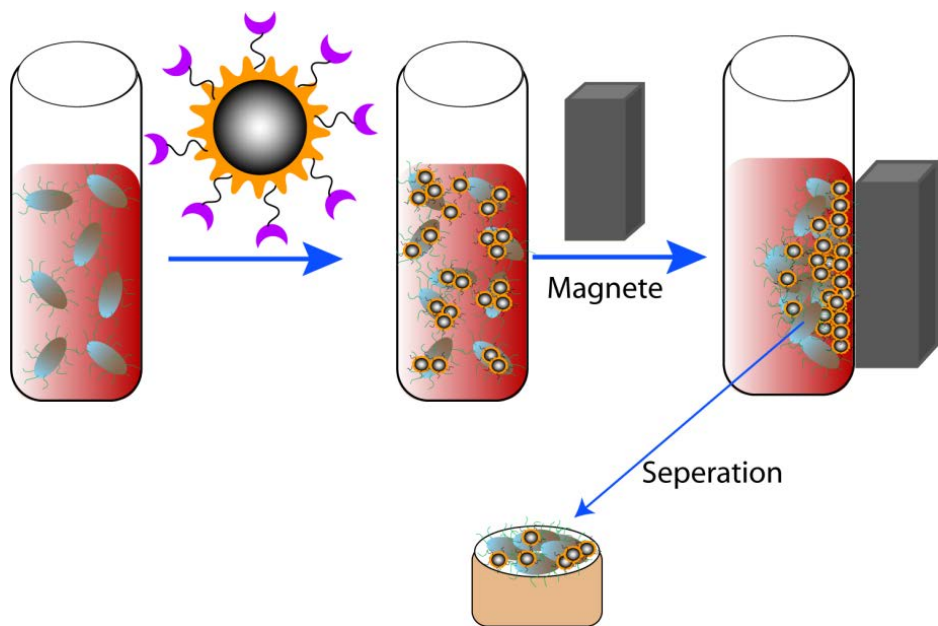
*Chemical Review, 2013,*

# Long Range Ruler for Biological Process Monitoring



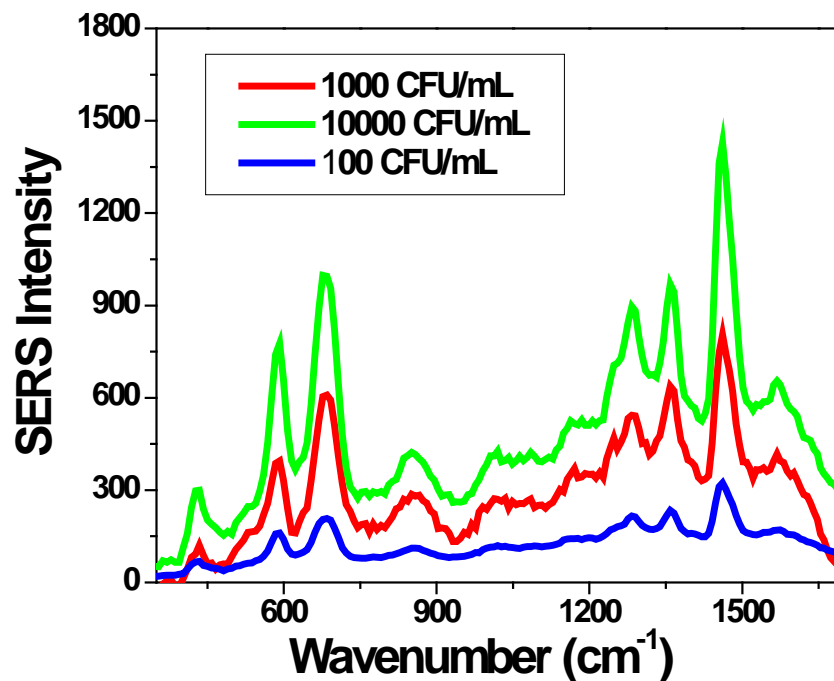
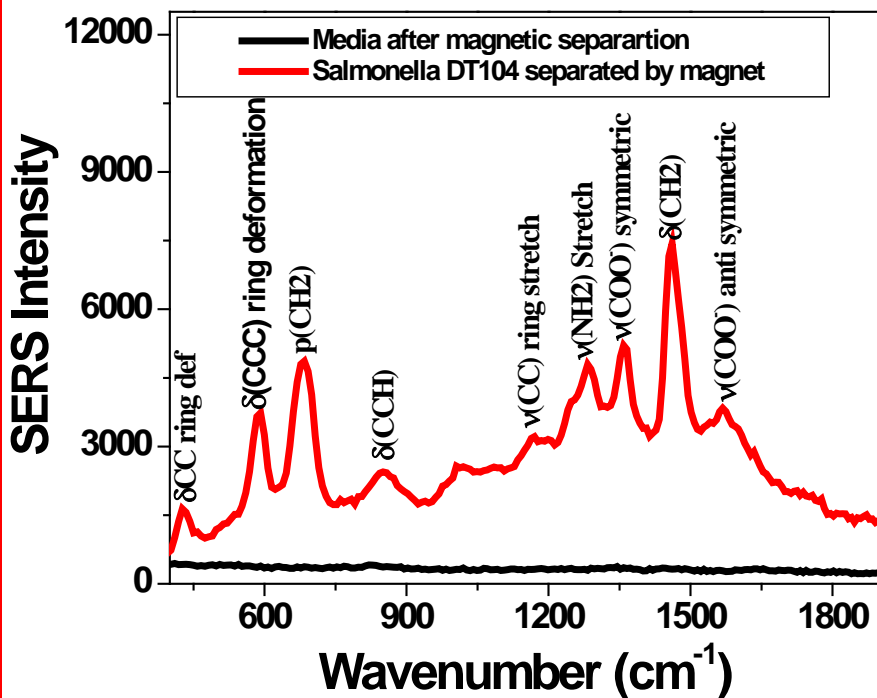


# Multifunctional Nanoparticle for Separation & Enrichment, Label-Free SERS Imaging



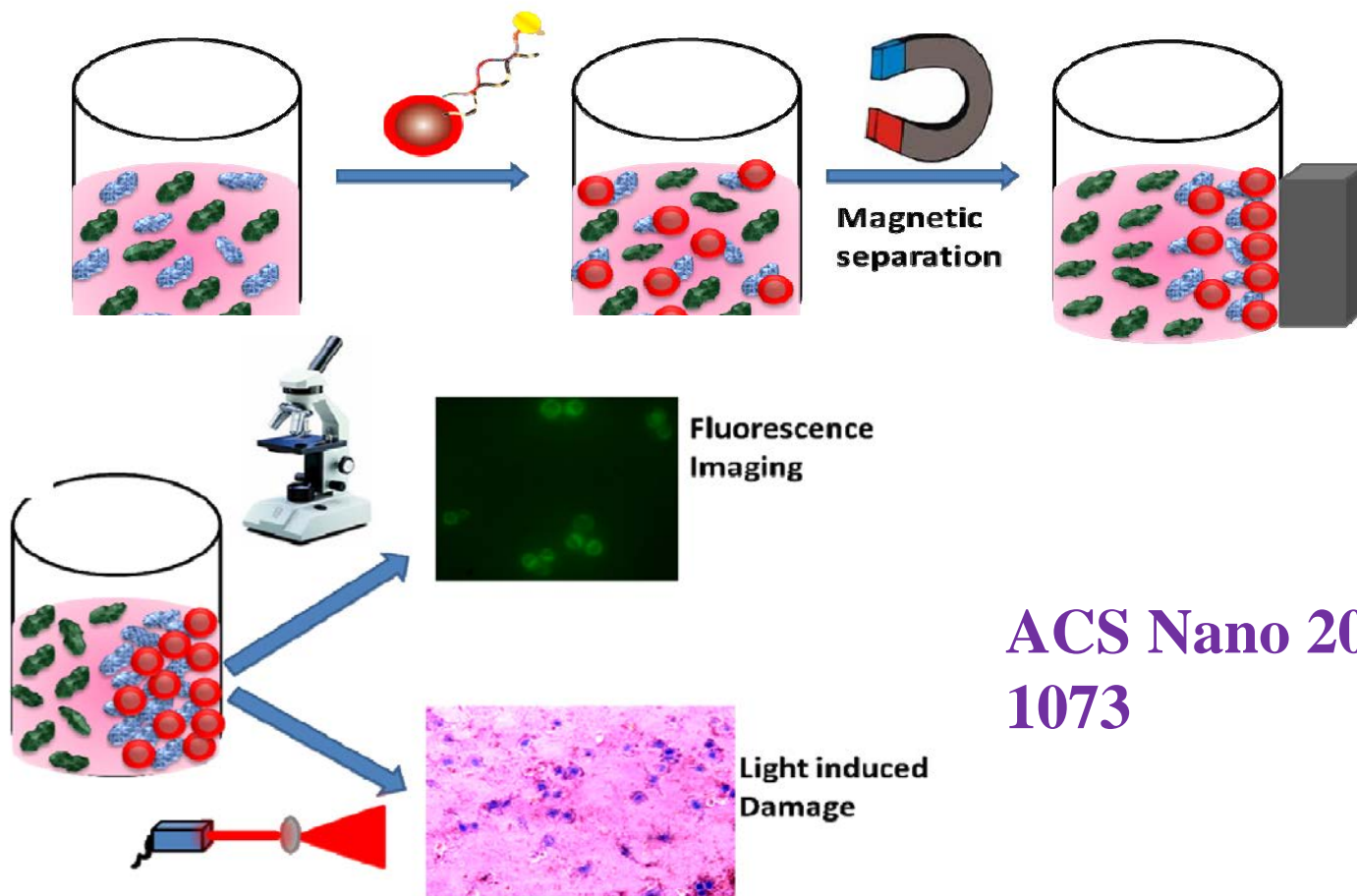
Chem. A. Eur. J. 2013, 19, 2839-2847

# Label Free SERS assay for Bacteria Sensing



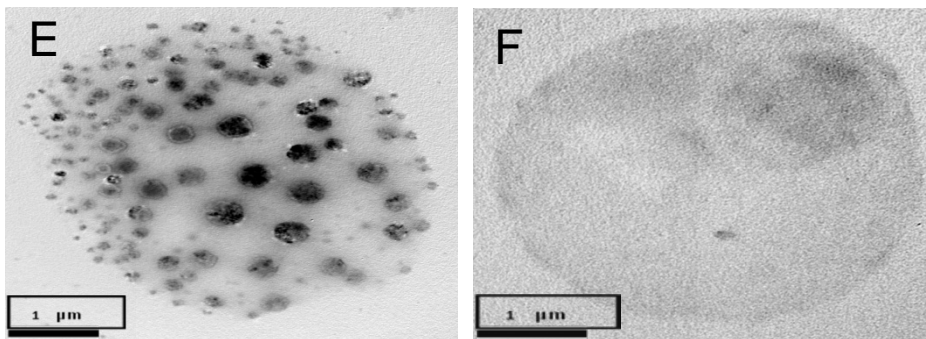
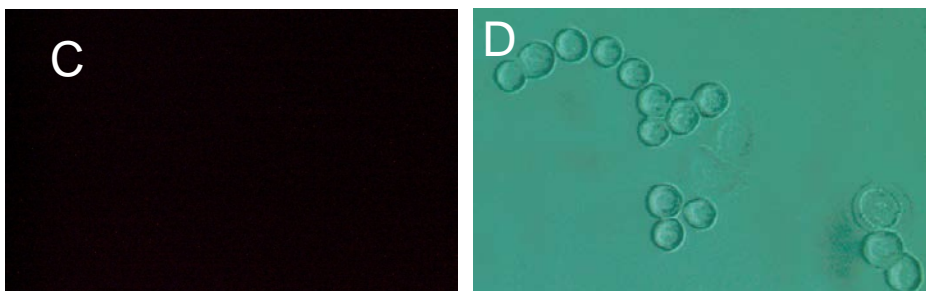
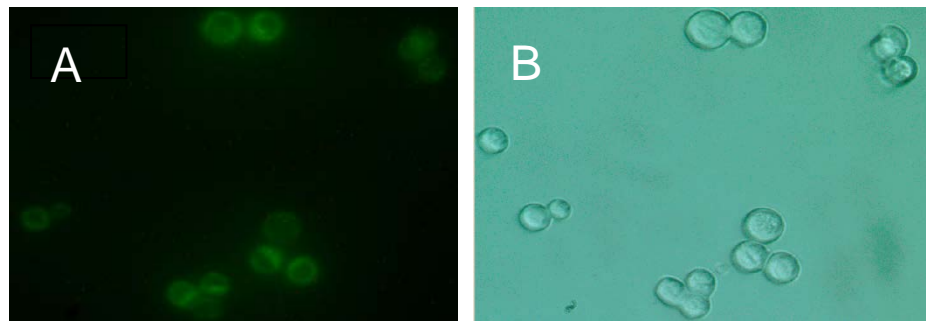
**Chem. A. Eur. J. 2013, 19, 2839-2847**

# Multifunctional Nanoparticle for Cell Separation



ACS Nano 2012, 6,1065–1073

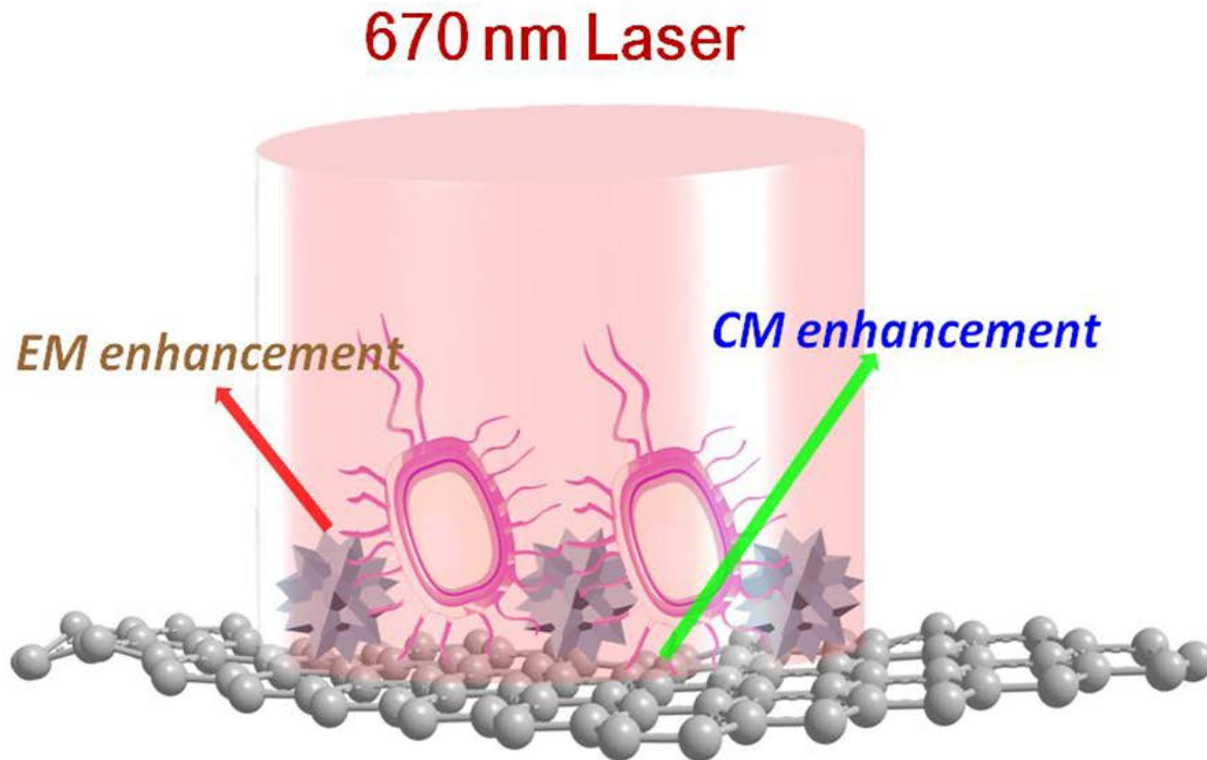
# Cell Separation (.001% mixture)



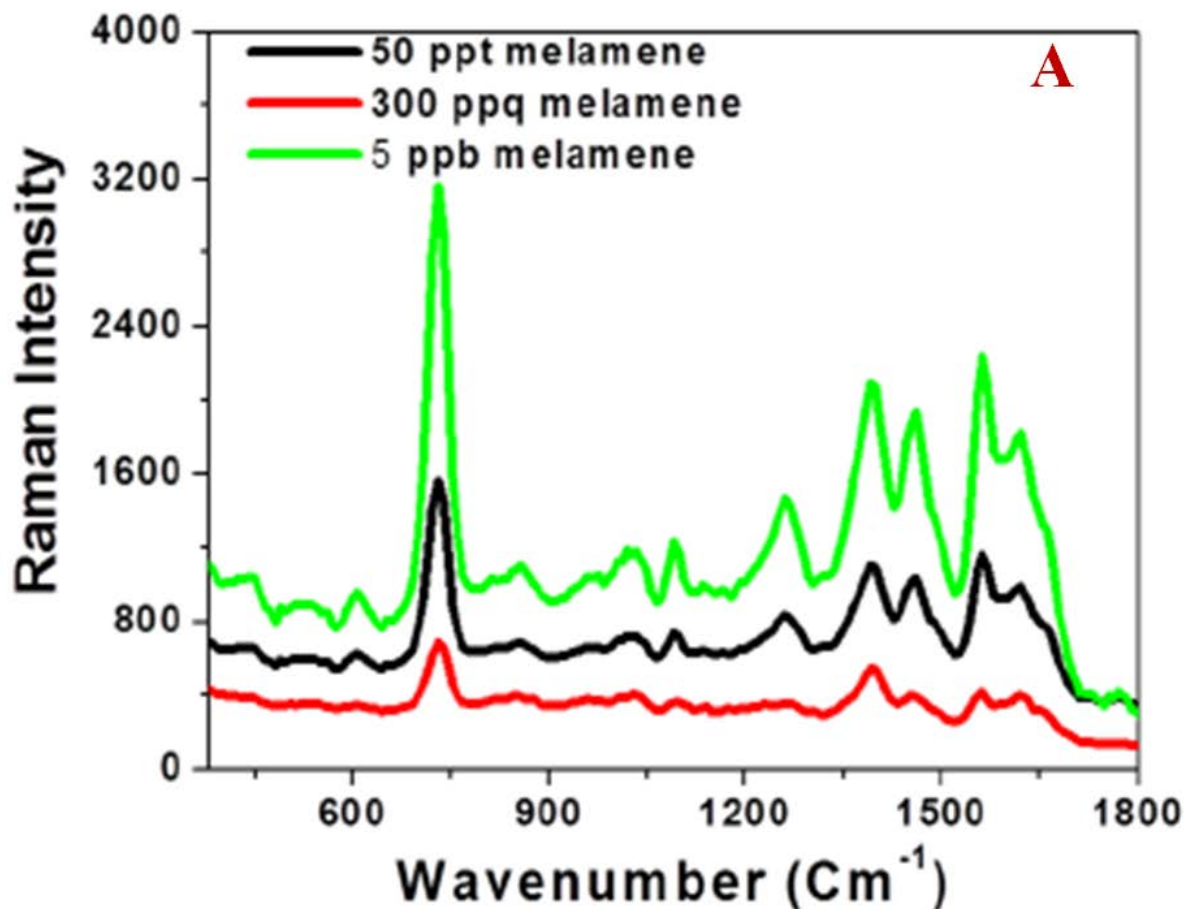
**ACS Nano, 2012, 6,1065–1073**



# Plasmonic Graphene Base SERS Substrate



# Multifunctional Plasmonic nanoparticle for Melamine detection in Parts Per Quadrillion Level



## **Conclusion**

**We have developed Several types of multifunctional materials**

**We have shown that our developed multifunctional materials can be used for multimodal Purpose**

**Any Questions?**

**Thank you for your kind attention**