Saudi Arabian International Chemical Sciences
ORGANON
Chapter of the American Chemical Society 2017 Issue 1

Please send your comments, suggestions and articles to newsletter director:
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INSIDE

SAICSC-ACS PROVIDES AN EXCELLENT PLATFORM TO SHARE TECHNICAL KNOWLEDGE FROM WIDER SPECTRUM OF INTELLECTUALS

WELCOME **NOTE FROM CHAIRMAN**

Dr. Mohammad Nahid Siddiqui
mnahid@kfupm.edu.sa
SAICSC-ACS Chairman, 2017

On behalf of the 2017 the Saudi Arabian International Chemical Sciences Chapter of the American Chemical Society (SAICSC-ACS) board of directors, I would like to welcome all valuable members, speakers, volunteers and sponsors through the first issue of the Organon newsletter of 2017. I take this opportunity to sincerely thank the 2016 BODs for their untiring efforts and wonderful achievements. The most notable accomplishment is the successful organization of 10th CHEMINDIX, which has certainly raised the bar of standard and challenge to future conferences. I would also like to welcome the 2017 board of directors and fully confident that they will strive their best to add more values and laurels to established foundations.

SAICSC-ACS provides an excellent platform to share technical knowledge from wider spectrum of intellectuals. It is a right place to network and foster new relationship with individual entities as well as industrial and academic institutions. Establishment of SAICSC-ACS's Student Chapter at the KFUPM has provided more avenues to the students to visit and interact with different industries and Research & Development centers in the Kingdom. Society takes pride to support students' chapter financially to nurture the young talent and encourages them to participate in American Chemical Society National Meetings being held in USA.

Society has successfully embarked upon inviting renowned academicians, business leaders and entrepreneurs to be speaker in its technical meeting programs. Therefore, it gives me great pleasure to invite you all to attend our monthly meetings and participate in other activities. It is worth mentioning here that the director of Organon has already invited articles and the cash prizes at the annual gathering will reward the best three articles.

However, the quest for excellence and taking the society to new horizons is a daunting task but equally confident that with the cooperation and support of all, it is not impossible. Society is determined to engage more schools and female students in order to spread the knowledge of chemical sciences in the community. More collaboration with other societies is another priority.

Once again, thank you all and I wish you the best of year 2017. Please don't hesitate to contact me or Newsletter director for any comments and suggestions.

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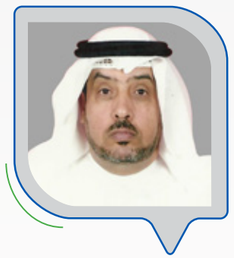

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Dr. Hind Al-Johni (Invited BOD)
Publicity and Outreach Director

2016 - ANNUAL GATHERING

The 2016 SAICSC-ACS Annual Gathering was held on 22/01/2017 at Le Meridian Hotel, Khobar. The gathering attracted different executives from Saudi Aramco and major local companies, SAICSC-ACS board of directors, and society members.

Mr. Ibrahim Al-Ghamdi highlighted the main accomplishments and achievements during the year 2016 which includes:

1) SAICSC-ACS remarkable activities to raise the profile of chemistry science in Saudi Arabia as well as in the Gulf region.

2) The extraordinary efforts to successfully organize the 10th International Conference and Exhibition on Chemistry in Industry (CHEMINDIX-2016) under the patronage of His Royal Highness Prince Khalifa bin Salman Al Khalifa, Prime Minister of the Kingdom of Bahrain.

A video tape by the society chair Mr. Ibrahim Al-Ghamdi has been delivered to the audience on the major activities of the chapter during the year 2016. Nobody denies that our local sponsors are real partners in our success stories. The gathering was a chance to recognize them and express our sincere appreciation for their continuous support which has played an important role of achieving the society objectives.

FEBRUARY 2017
TECHNICAL DINNER MEETING

"Photochromic Compounds as Smart Switchable Glazing for Daylight Control in Building"

Prof. ABDULLAH MOHAMED ASIRI

The Saudi Arabian International Chemical Sciences Chapter of the American Chemical Society held its February monthly technical dinner meeting on 13th February in Le Meridian Al-Khobar Hotel, Al-Khobar.

Professor **ABDULLAH MOHAMED ASIRI** delivered an excellent lecture on "Photochromic Compounds as Smart Switchable Glazing for Daylight Control in Building"

Prof. Abdullah M. Asiri: He received PhD from University of Wales, College of Cardiff, UK in 1995. He is the Head of the Chemistry Department at King Abdulaziz University since October 2009 and he is the founder and the Director of the Center of Excellence for Advanced Materials Research (CEAMR). He is a Professor of Organic Photochemistry since 2004. His research interest covers color chemistry, synthesis of novel photochromic, thermochromic systems, synthesis of novel coloring matters and dyeing of textiles, Materials Chemistry, Nano-chemistry and Nanotechnology Polymers and plastics. He is the Editor-in-Chief of King Abdulaziz University Journal of Science. He is also a member of the Editorial Board of Pigments and Resin Technology (UK), Organic Chemistry in Sight (New Zealand), Designed Monomers & Polymers and Journal of Single Molecule Research. He is the Vice-President of Saudi Chemical Society (Western Province Branch). He hold Five USA patents, more than 865 Publications in international Journals with more than 11000 citation and h-index of 47, Seven book Chapters, and 14 Books.

In his speech, he explained the importance and applications of the pigments and photochemistry. Society members were actively engaged with Dr. Asiri's reasearch topic. The session ended with lucky draws and prizes.

BIOCOMPATIBLE POLY (VINYL ALCOHOL)
NANOPARTICLE-BASED BINARY BLENDS FOR OIL SPILL CONTROL

Dr. Hind Aljohani is working as Assistant Professor Fellow at University of Tabuk, Alwajh College. Dr. Aljohani received her PhD in physical Chemistry from KING ABDULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY in 2016. Her research is related to Nano-Catalysis, Homogeneous, Heterogeneous Catalysis and Green Chemistry.

Oil released through industrial wastes, oil leakage and oil spills can have a catastrophic effect on the environment and aquatic system. Recently, polymeric nano absorbent materials have been extensively investigated in the removal of oil from oil spill sites, which has largely contributed to reduce environmental pollutions. Moreover, PVA can be produced on an industrial scale at relatively low cost and has a broad range of hydrolysis and degree of polymerization. PVA as a candidate for environmental applications.

We report the development of a facial and cost effective method for blending PVA nanoparticles with chitosan or starch to form a uniform nano membrane that can be used for oil spill recovery.

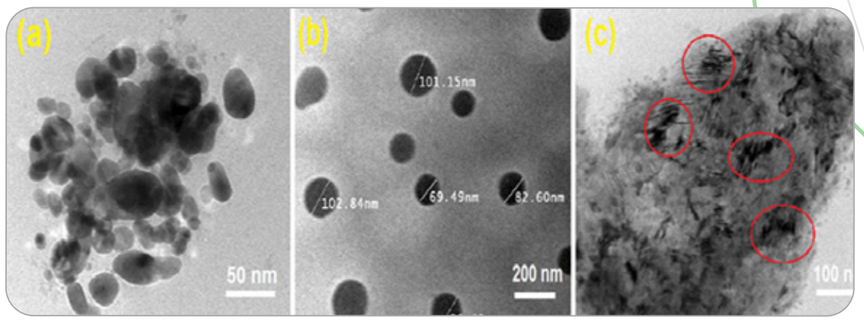


Fig. 1. TEM images of (a) PVAn, (b)PVAn/Ch, and (c) PVAn/St.

Fig. 1 shows TEM images of PVAn, PVAn/Ch, and PVAn/St. PVAn are mainly aggregated with particle sizes b50 nm. In contrast, PVAn/Ch showed a highly monodispersed network with the size average of 88.5 nm. The most interesting result here is the uniform size, shape, and dimension of the formed nanoparticles PVAn/Ch, which may be originated from the cationic charges present around the particles. which is in agreement with the SEM confirmation (Fig. 2) of the cross-section of the different films. PVAn nanoparticle film had a continuous and broken interconnected network fibril structure and exhibited cavities ranged from small and large sponge-like pores. For PVAn/Ch binary blend, increasing the viscosity of the solution leads to lower degree of entanglements and slower dynamics of phase separation. Moreover, the formation of a soluble complex between PVAn nanoparticle and Ch may delay the phase separation behavior, which leads to some holes between the phases.

BIOCOMPATIBLE POLY (VINYL ALCOHOL)
NANOPARTICLE-BASED BINARY BLENDS FOR OIL SPILL CONTROL

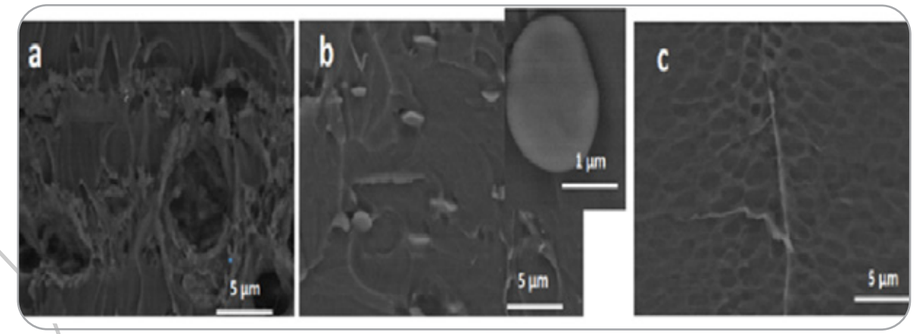


Fig. 2. SEM micrographs of the cross-section for (a) PVAn, (b) PVAn/Ch, and (c) PVAn/St.

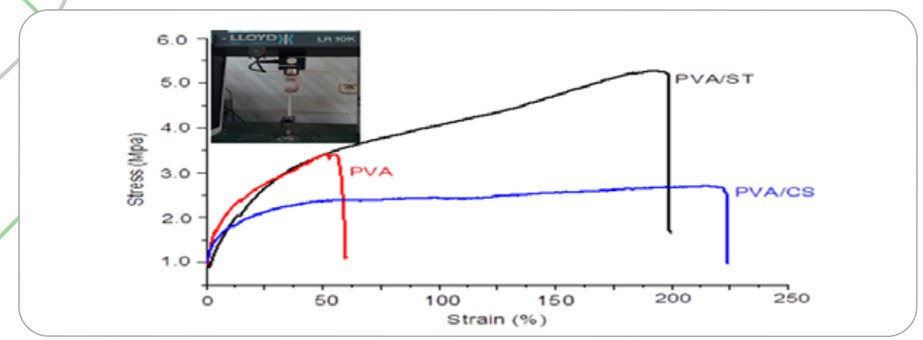


Fig. 3. Typical stress-strain curves of PVAn-based nanoblends

Fig. 3 shows the improvement in mechanical properties of St > Ch > PVAn blend membranes can be attributed to the biocompatibility and relative facility of obtaining materials with enviable properties without any significant changes or investments on the conventional process. Thus, PVAn/Ch or PVAn/St blends are a versatile technological solution to obtain polymeric materials with myriad specifications and a good mechanical property.

When using oil/water mixture, as a simulated oil slick system, the nanoblends showed higher absorption capacity and excellent selectivity. The absorbed oils can be recycled by applying manual pressure by simply rolling the nanoblends with hand, and an oil recovery rate of 96.3% was attained. Nanonetwork, strong mechanical property, and hydrophobic surface can contribute to superior performance, which gives an ideal solution for absorbing oil spills by using these nanoblends.

STRUCTURE ENGINEERING OF SEMICONDUCTOR MATERIALS
FOR VISIBLE LIGHT DRIVEN WATER SPLITTING APPLICATIONS

IBRAHIM KHAN
PhD student, Department of Chemistry, KFUPM
(email: ebraheem@kfupm.edu.sa)

INTRODUCTION

Semiconductor nanomaterials are well known for their exceptional optoelectrical applications. These properties arise from their tunable bandgap and band edges through surface modification, doping of different nonmetals like doping of sulfur sulphidation and nitridation (GaO_xN_y sand flowers), co-catalysis ($Ag/Fe_2O_3/TiO_2$/ nanotubes), hybrid/ heterostructure formation (rGO/ZnO nanowires), oxygen vacancies and defects formation etc. These modified nanomaterials can be effectively employed in CO_2 conversion to fuels and water splitting applications. Photoelectrochemical water splitting generates oxygen and hydrogen under control conditions and the process is considered to produce enough energy to replace the fossil fuels.

METHODS AND TECHNIQUES

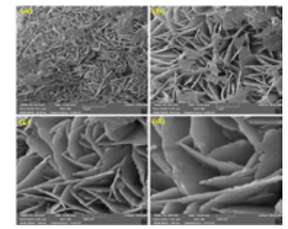
The semiconductor oxide materials are normally prepared from there salt precursors through various synthetic protocols like hydrothermal/solvothermal method, sol-gel approach, physical or chemical vapor deposition (PVD/ CVD). Electrochemical deposition is also employed by our group to synthesized oxides of Titanium (Ti), Indium (In), Tungsten (W) and Tin (Sn). The important synthetic parameters were controlled to achieve specific morphology, particle size and homogeneity.

CHARACTERIZATION TECHNIQUES

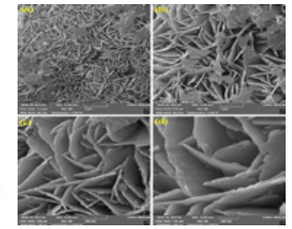
Morphological features usually investigate via FE-SEM, TEM and AFM techniques. XRD and XPS explored the crystallinity and phase with the information of oxidation states and bonds of the product components, respectively. FT-IR and Raman determine the vibrational characteristic of the formed materials. The optical properties are extensively studied via UV-Vis and photoluminescence (PL) techniques. The photoelectrochemical performance of the materials is determined via three electrodes solar cell supported by calibrated potentiostat and solar simulator.

RESULTS AND DISCUSSION

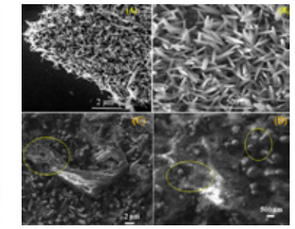
The FESEM images provided three different photoactive systems



A) Gallium oxynitride (GaOxNy)

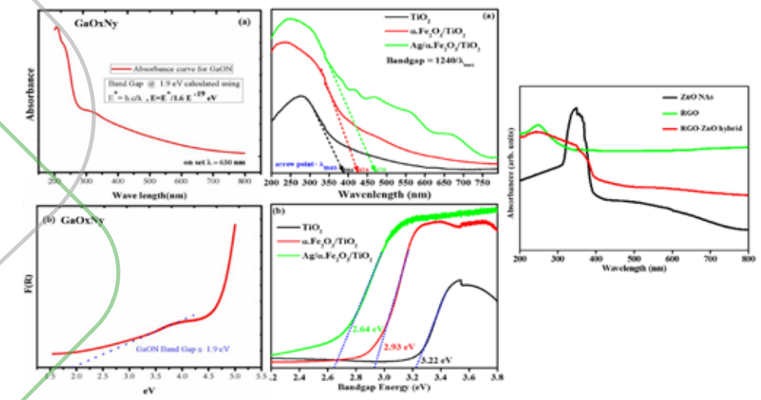


B) Fe2O3/TiO2 Nanoarrays



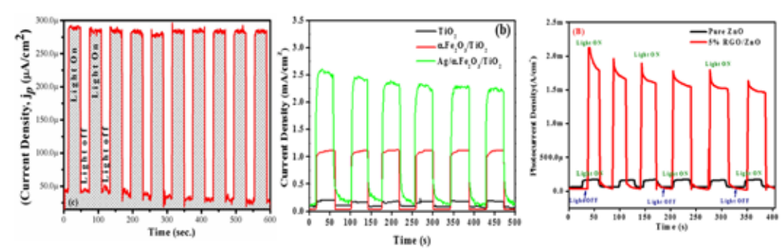
C) rGO/ZnO

OPTICAL PROPERTIES IN TERMS OF UV-VIS AND BAND GAP



PHOTOELECTROCHEMICAL WATER SPLITTING

All the systems were tested for PEC water splitting and the results under chopped light is provided below.



The exact engineering of materials surfaces and their bandgap via doping, co-catalysis and hybrid formation can effectively enhanced the overall water splitting, is indicated in chopped PEC diagram respectively.

MARCH 2017
TECHNICAL DINNER MEETING

"Droplet Chemistry"

Prof. RICHARD N. ZARE

The Saudi Arabian International Chemical Sciences Chapter of the American Chemical Society held its 2017 monthly technical dinner meeting on March 5th in Al-Khobar.

Professor **RICHARD N. ZARE** delivered an excellent and inspiring lecture on "Droplet Chemistry"

Richard N. Zare is the Marguerite Blake Wilbur Professor in Natural Science at Stanford University. Professor Zare is renowned for his research in the area of laser chemistry, resulting in a greater understanding of chemical reactions at the molecular level. By experimental and theoretical studies he has made seminal contributions to our knowledge of molecular collision processes and contributed very significantly to solving a variety of problems in chemical analysis. His development of laser induced fluorescence as a method for studying reaction dynamics has been widely adopted in other laboratories. Professor Zare has received numerous prestigious honors and awards among which are the 2011 King Faisal International Prize in Science and the 2000 Nobel Laureate Signature Award for Graduate Education, American Chemical Society. Professor Zare has given named lectures at numerous universities, has authored and co-authored over 1000 publications and more than 50 patents, and he has published four books

In his speech, he highlighted one significant advantage of investigating reactions in microdroplets is that this technique allows to detect and identify fleeting intermediates in complex reactions. Another special feature of microdroplet chemistry is that the rates of some reactions can be accelerated by a factor of 1000 or more.

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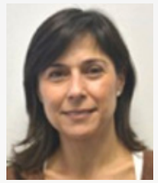

Dr. Christina Martinez
Instituto de Technologia Quimica

Prof. Carsten Schwandt
National Chair of Materials Sc. & Metallurgy Distinguished Visiting Fellow,
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