

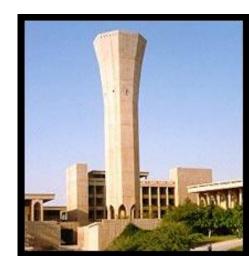


Nanotechnology Research on Campus



Zain Yamani **CENT Director** 18-5-1431





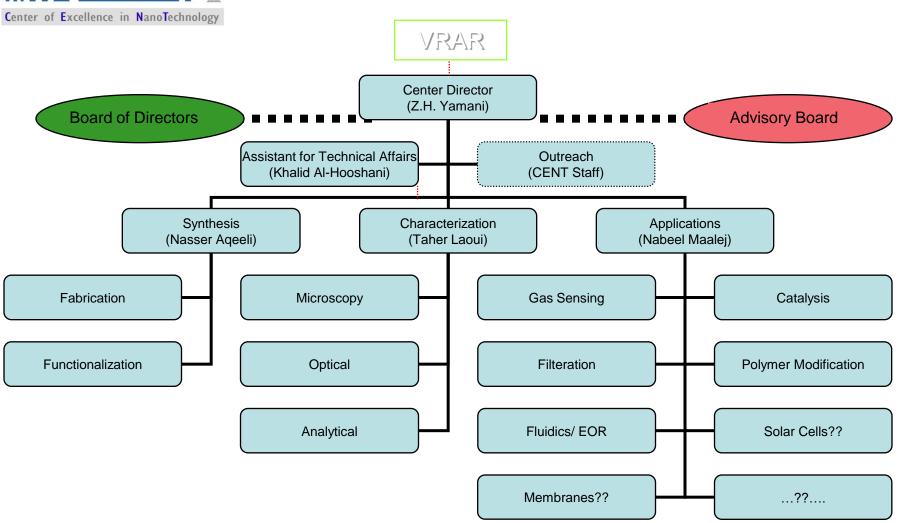


Funding Organs/ programs

- CENT
- MIT Collaboration
- DSR
- NSTIP program
- KACST Annual
- TIC



CENT structure





CENT: Vision and Mission

Vision:

CENT shall be an internationally recognized leading research center that develops innovative research and cutting edge knowledge in the field of Nanoscience and Nanotechnology

Mission:

CENT will be the platform through which KFUPM shall develop a Nanotechnology Program that enables its scientists and faculty members to carry out world-class Nanoscience and Nanotechnology based research in areas of strategic importance for the Kingdom, and support the same through teaching at KFUPM



CENT: Objectives

- 1. To build up a world class human resources research capacity including highly qualified scientists and staff and trained graduate students in the field of nanomaterials synthesis and their characterization & applications.
- 2. To develop a research infrastructure including state of the art facilities that enables the Center to achieve its goals.
- 3. To develop innovative nanotechnology-based solutions in strategic areas for the Kingdom related mainly to petroleum and petrochemical industries.
- 4. To establish Industrial Partnerships with relevant companies and entrepreneurships as a step toward commercialization, in coordination with DTV.
- 5. To contribute to the development of teaching graduate programs and training students in the field of nanotechnology.
- 6. To promote public awareness regarding the benefits and the risks of nanotechnology.



CENT Affiliates:

Abdullah Al-Sultan

Abdul-Nasir Kawde

Anwar-ul-Hamid

Ahsan-ul-Haqq

Bassam Tawabini

Belabbes Merzougi

Khalid Arafeh

Khalid Al-Hooshani

Nageh Allam

Oki Muraza

Nouar Tabet

Nasser Ageeli

M. Ashraf Gondal

Muataz Ali Atieh

Tahar Laoui

Mazen Khaled

Nabeel Maalej

Saheb Nouari

Qamar Azmi

Saleh Al-Quraishi

Syed Ahmed Ali

7ain Yamani

PETE

Chemistry

CER

CENT

ES

CENT

CENT

CENT/ Chemistry

CENT

CENT

Physics

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Physics

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There is an ad-hoc committee appointed, and a proposal almost finalized for a recommendation on a Clean Room Facility

Main sponsors: CoRE-RE, CENT

Contact: Dr. Amir Abdullah



Can there be nanotechnology without a Clean Room??

Chemical Synthesis

Characterization

Of course.. YES!!

Nanopowder Metallurgy

Nano-Materials Development

Applications Lab

Building-1, rooms: 116B, 116A, 119, 120

Satellite Labs

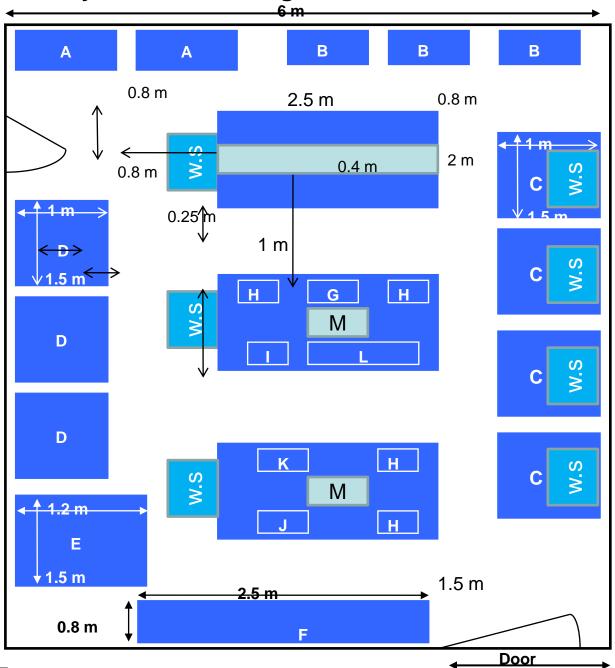
Production Lab

Contact: Dr. Khalid Al-Hooshani

CENTER SERVICE OF Excellence in NanoTechnology

Door

Synthesis Lab. Bldg 1 Room 116B



1

2.2 m

1 m



CENT Areas of Focus

focusing on the petroleum and petrochemical industries.

- 1. Nano-engineered Catalytic and Photocatalytic Materials
- 2. Nano-structured Materials for Sensing Applications
- 3. CNT Applications







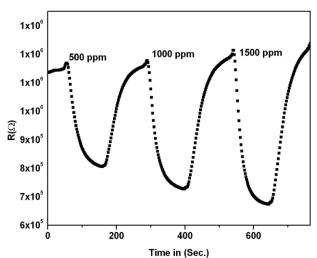




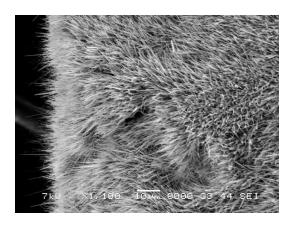
Zinc Oxide Nanowires/ Nanodots

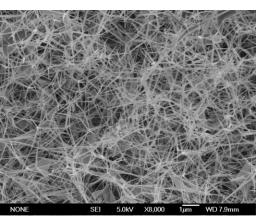
N. Tabet et. al (Physics & CENT)

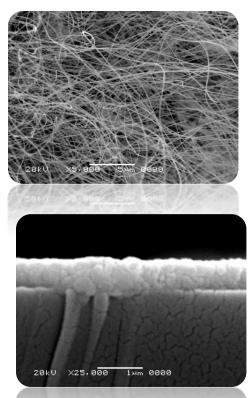
Dynamic and fast response of MW ZnO nanowires to H₂ gas at different temperatures

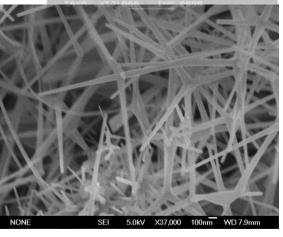


Operating temp. 200°C temp. Measured by Dr Ahsan, Tokayama, Japan, Oct. 2008. Unpublished













Nano-Carbon Research Unit

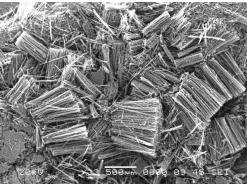
Applications





Synthesis and Characterization

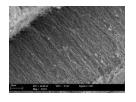


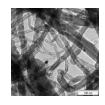


Fabrication and Design of Reactors









NCRU applications

- Improving of the mechanical properties of composite polymers
- Catalyst for polymerization (or inhibition)
- Developing rubber super tires
- Improving heat exchanging
- Water decontamination















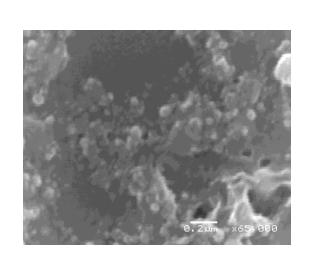
Pulsed Laser Ablation for synthesis of nanostructures







video









Publications

Center of Excellence in NanoTechnolog



and

Ultra fast synthesis of zinc oxide nanostructures by

N. Tabet 4*, R. Al Ghashani 4, S. Achour b * Hypics Department, Center of Exeminator in Nature chanlogy (CENT), King Field University of Fetroloum and Mitternit, Studi. Feable.
* Commun. Laboratory, University Measure, 2009 Community, Rigaria

American Journal of

Patents

American Journal of

	Unite Al-Qura	d States Patent	US007601324B1 (b0) Patent No.: US 7,601,324 B1 (45) Date of Patent: Oct. 13, 2009					
(54)	METHOR	POR SYNTHESIZING METAL	6.5	16,362 31 * 01,059 31 19,397 31 *	12/2002	Krigori et al		
(75)	Inventor	Seleh L. Al-Quraishi, Disaloss (SA)	6,87	13,019 Bil	12:3094	Lewis, III et al.		
(13)	Assigner	King Fuhd University of Petroleum and Minerals, Disdran (SA)	7,84 7,64 7,21	0,416 B2 4,468 B1 * 7,460 B2 * 11,236 B2	6/2006 6/2006 5/2007	Korthora et al. Kinshall et al. 255/424 Louis et al. 15/362 Stark et al.		
(*)	Notice	Subject to may disclaimer, that term of the parent is extended or softened under 35 U.S.C. 154(h) by 0 dees.		08683 A1*	4/2003	Reitr et al		
		Date. Dept by 0 days.		2000				
(21)	Appl. No.:	12/216,835		FOREIGN PATENT DOCUMENTS				
(22)	Filed:	Jul. 11, 2008	CA	246	6765 A1	5/3803		
on	Int. Ct.				(Con	tiosel)		
(24)	B23B 5/26 (2006.01)			OTHER PUBLICATIONS				
	COLF 7/42	(2006.01)	Straken	Olot same	-	and experision of the American		
(22)	U.S. CL	423/592.1, 423/625, 423/593	Consess 5	ociety)."		and information of the venezion.		
	423/617, 423/622, 423/523, 423/546, 423/442; 423/211, 422/186, 64; 75/65; 75/65; Field of Classification Search 423/922, 423/617, 612, 623, 593, 1, 625; 75/345, 342, 423/617, 612, 623/62, 406, 423/61, 612, 623/62, 626, 423/61, 612, 623/62, 626, 423/61, 623/62, 626, 623/62, 623/			(Cortinuel) Privacy Exeminer Maivin C Mayes Austines Exeminer—Jun 1; (44)-600-97-, digest, or Free —Richard C. Linzan				
(58)			Primary Authors					
	See imbites	tion life for complete sough history.	(57)		4897	TAKE		
(16)		References Cited	40.00			The state of the s		
	U.S. PATENT DOCUMENTS		The method for synthesizing stetal oxide manapawdar pro- duces powders of nanomenicle size from metals having sela-					
- 77	255.675 A	ALTONO Charlestone in	Hugh you	thank you had not represent the from the relationship.				





0749-6006;5 - see from matter © 2009 Elsevier Ltd. All rights reserved. doi: 10.1016;j...ppmi.2009.073.002

Moving Enzyme-Linked ImmunoSorbent Assay to the Point-of-Care Dry-

Abdel-Nasser Kawde, 1, 2, 3* Xun Mao, 1 Hui Xu, 1 Qinga Added-voser Karela. "" Ann Mas, 'Bis Xu, 'Gings 'Department of Casering and Merichae Bloog,' South Distant and Casering and Merichae Bloog,' South Distant and Casering of Excellence in Manutathology, and Department of Casering Technology. Casering Department of Casering Ca The synthesis of nanostructured ZoO of various shapes has been the subject in the last decide. A wide variety of techniques have been used by various catalyna-stricted Vapor Esquis Solis (VISE) 1–3) and thermal evaporation using Recently, ZoO micro- and not structures including nanowds and sancturies he synthesized by using microwave thermal esquapation deposition on supplies and this work, we have developed vary simple method by synthesized nanostructure ending a rew SiG-Notled recognition as harder which can reach temperature as a formal part which can reach temperature as the content of the part which can reach temperature as the content of the part which can reach temperature as the content of the part which can reach temperature as the part which can

Reagent Strip Bit

Beceived: 10 May 2009; Revised: 13 July 2009; | Accepted: 27 Ju

Abstract
In fiss work, we described a point-of-care (POC) dry-ret
taxers and portable step reader for simple, low-cost and a
Horsentiah Presidate (HPP) and Rubbel (4gr (Ft-Gr) were
of the proof-of-concept. The anadvick-type simumoneutic
tracers were captured on the test zone of the broscener. The
control work of the bissenser frough the inmobilized second
the preserve of the assistant produced mobible conymatic
control zone of the 19828 and formed to characteristics bit control addies of the Dixest Sand Immed two characteristics this observing the color change of the text zone, quantitative data text zone with a portable 'strip reader'. The quantitative reg of 1-10 g mil. "If go in association with a 10-min seasy treatment of the 0.05 mg/ml., which is ten times lower than the text control of the 0.05 mg/ml., which is ten times lower than the resumment of Dixest was used to detect Carcinoculey we successfully. Such curve-based Dixest Southern a simple and portation in the text that the storyme indeed lummun overtain inholiumtor for the text faction that payme indeed lummun overtain inholium of the text faction that payme indeed lummun overtain inholium of the text faction that payme indeed lummun overtain inholium of the text faction that payme indeed lummun overtain inholium of the text faction of the payment of the text faction of the payment of the payment

Keywords: ELISA; Biosensor; Enzyme: Point-of-care; Dry-1



Synthesis of highly active nanocrystalline WO3 and its application in laser-induced photocatalytic removal of a dye from v

M. Qamar ², M.A. Gondal ^{3,5,4}, Z.H. Yamani ^{2,5}

Moving Enzyme-Linked ImmunoSorbent Assay to the Point-of-Care Dry-

Reagent Strip Biosensors Abdel-Nasser Kawde, ^{1,2,3*} Xun Mao, Hui Xu, Qingxinng Zeng, Yuqing He, ^{1,4} Guodong Liu^{1*}

Keywords: ELISA; Biosensor, Enzyme; Point-of-care; Dry-reagent strip.

Ast. J. Biersenl, Sci. 2009, 4(x), 200-200. © 2009 by NWHI. All rights reserved.

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title nam.

Internation of the Transcript of the

Column 8. Line 30, delete "Presebt" and insert -- Present -- therefor

Column 9. Line 24, between "viscosity" and " $=10^{-3}$ * delete " π " and insert $= \eta$ = therefor Line 24, delete "Robroson" and insert - Boltzmann - therefor

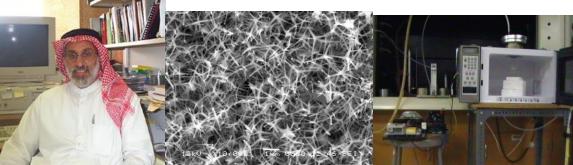
Column 15. Line 8, delete "2 m" and insert -- 2 µm -- therefor

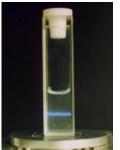


Signed and Sealed this

Ninth Day of August, 2005











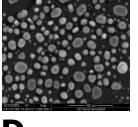
Running CENT projects (2008)

#	Title	Focus Area	PI	e-address
1	Biocide properties of novel polyelectrolytes nanofilms	Nano-Bio	Mazen Khaled	mkhaled@kfupm.edu.sa
2	Production of Carbon Nanotubes (CNTs) by using Gas/Solid Atomizer Chemical Vapor Deposition (GSA-CVD) for Nanocomposite Application	CNT	Mo'taz Ali	motazali@kfupm.edu.sa
3	Study of the Structural Properties and Hydrodesulfurization Activity of MoS ₂ and Co/MoS ₂ Catalysts Prepared by Laser Pyrolysis	Catalysis	Zain Yamani	zhyamani@kfupm.edu.sa
4	Development of High Performance CNTs and SiC Reinforced Metal Matrix Nanocomposites for Pistons Applications	CNT/ Corrosion	Saheb Nouari	nouari@kfupm.edu.sa



Equipment





XRD



Home-made

DC-Magnetron

TEM









Lasers





PVD/ CVD



Institutional Collaborations

Туре	Academic		Industrial
Domestic	Dammam Univ.		S. Aramco up-stream
	KFU		S. Aramco down-stream
	KAUST		Tasnee
International	CISM	CEA	RTI (potentially)



Project Title: Study of the Structural Properties and Hydrodesulfurization Activity of MoS₂ and Co/Ni/MoS₂ Catalysts Prepared by Laser Pyrolysis

Investigators:	PI: Zain Yamani ⁽¹⁾ Co-I: N. Tabet ⁽¹⁾ , Co-I: S. Ali ⁽²⁾ Frederick Schuster ⁽³⁾ Hicham MASKROT ⁽³⁾ (1) Center of Excellence in Nanotechnology and Physics Department, KFUPM (2) Center for Refining and Petrochemicals, KFUPM (3) Advanced materials Program, CEA-France
----------------	--

A 3-way collaboration, a subject that is important to the Kingdom, potentially supported by the Industry, potential IP ownership, not that much overhead

C 10hm 500nm
C d 200nm 500nm
C (1 500nm
C (200nm 500nm)
C (200nm 500nm)
C (200nm 500nm)

Adv. Mater. 2006, 18, 2561-2564

By Fangyi Cheng, Jun Chen,* and Xinglong Gou

Fabrication of NP
Impregnation
Characterization
Testing for HDS



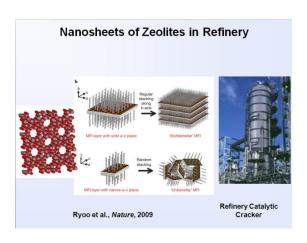
Schuster, CEA-France

We like to build a larger teams in the field of nano-engineered catalysis



Currently, CENT is building (human and hardware) capacity in:

- 1. Nano-engineered materials for Catalysis, especially for:
 - a. HDS
 - b. CO₂ conversion
 - c. for polymerization
 - d. photocatalysis
- 2. Gas sensing (of H_2S , H_2 , SO_x , NO_x , or otherwise)
- 3. Environmental applications (especially water decontamination)
- 4. Enhancing of the mechanical properties of composite polymers
- 5. Enhanced Oil Recovery (EOR)





CENT sponsored NSTIP Projects [May 2010]

Development of advanced and functional nano-structured mesoporous zeolites for hydrodesulphurization and other catalytic applications in petroleum and petrochemicals

Zeolite Nanosheets as a Materials Platform for Improved Refining Catalysts

Carbon Nanofibers Grown on 3-D Solid Structures for Applications in Energy-Related Catalysis

Development and characterization of high surface area metal carbides modified mesoporous carbons and ceramics for clean fuel and catalysis applications

Development of nano-structured metal phosphides for ultra-clean fuel and fuel cell applications

Development of Nitrogen-Modified CNTs as Pt-Free Catalysts for Fuel Cells

Electrochemical engineering of nano-structured materials for clean energy and energy conversion applications

Synthesis of Metal-Organic Framework Nanostructures for uptake of CO₂ and Hydrogen Storage

Design of Smart Fluids for Acid Delivery in Well Stimulation Treatment



CENT sponsored NSTIP Projects[May 2010]

Electrospinning of Semiconductor Metal-oxide and Polymer Nanofibres for Ultra-sensitive Amperometric Sensor

Synthesis of Mesoporous and Microporous Metal-oxides Nanostructured Materials for Hydrocarbons and NO_x Sensors

Comparative Study of Conversion of Carbon dioxide into high-value hydrocarbons using nanostructured materials by solar and laser irradiation

Development of highly efficient visible-light-driven nanostructured materials for photocatalytic applications

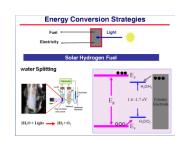
Photocatalytic Splitting of Water over mixed metal oxyhalides-based Catalyst using Laser Radiation

Activity of laser enhanced nano-structured oxides of tungsten, nickel, zinc, iron and titanium against Candida and Aspergillus

Lanthanide-doped oxide nanoparticles for Multi-modality Molecular Imaging Agents



Future Development



CENT could potentially develop competency in the focus area:

- o Materials development for membranes for gas separation (or otherwise)
- o Renewable energy applications (hydrogen production, or photovoltaics)
- o Hydrogen storage

Scale up: photocatalysis, CNT production

Larger mesoporous supports

Microporous (-2 mm)
Mesoporous (2-50 mm)
Metal oxides

Diameter of Mesopores

CTAB jib (2-50 mm)
Surfactant
CTAB jib (2-50 mm)
CATAB jib (2-50 mm)
CATAB jib (2-50 mm)
Surfactant CL (2-50 mm)
Surfactant SIO (2-50 mm)
Aging time
Solvent evaporation conditions
Humidity

We are concentrating on:

Employment..

Facilities..



Collaborations...

Industrial partners..



Miscellaneous

Visiting professors

Bi-weekly CENT Seminars

Friends of CENT Mailing list



Visiting professors

NTGP: graduate program (under development)

www.kfupm.edu.sa/cent

web-site & forum



In closing..

KFUPM is committed to Developing Nanotechnology on Campus

We'd be happy to add you to Friend's of CENT (e-)mailing list.

Just send us a note: cent@kfupm.edu.sa

We look forward to putting our hands in yours to synergistically develop research

Do not hesitate to contact us if you have suggestions or believe there is potential for collaboration.

Thank you for your attention

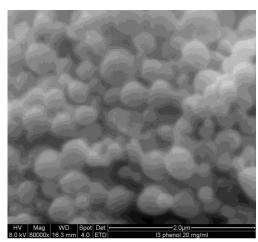




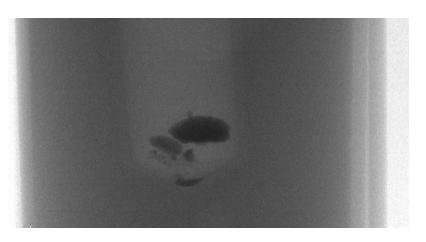
Polymer Nanoparticles for X-ray Imaging of Cancer Cells

Nabil Maalej (KFUPM) Feng Si Shen, Prashant Chandrasekharan (NUS)

Basic Idea: Encapsulate Iodine/High Z material in the polymer NPs and deliven them to the cancer cells using targeting molecules to make the cells more apparent. In the x-ray image



Polymer nanoparticle with Triodophenol



Triodophenol nanoparticles Micro CT X-ray Images



CENT in bullets

Center of Excellence in NanoTechnology

Organization Structure

- **CENT Executives Committee**
- Teams (Synthesis, Characterization, A
- CENT Board of Directors
- CENT Advisory Board

- Professor Sahl Abdul-Jawwad
- Dr. Mohammed Al-Humoud
- Dr. Zain Yamani
- Professor Nouar Tabet
- Professor Basel Abu-Sharkh
- Dr. Khalid Al-Hooshani
- Dr. Abdullah Al-Ja'fari
- Dr. Qasem Fallatah

Personnel

- Nearly 25 Kl with **CENT**
- Newly appoi
- post-docs &
- Prof. Munir Nayfeh

President NanoSi Advanced Technology (UIUC-USA)

Prof. M. Ishaque Khan

Associate Dean, College of Sciences and Letters (IIT-USA)

Prof. Helmut Dosch

DESY Chairman of the Board

Prof. Zbigniew Stachurski

Director, Centre for Science and Engineering of Materials (ANU-Australia)

Dr. Khalid Al-Biyari

Senior Vice President for R&D, Advanced Electronic Company-KSA

Mr. Jamal Al-Dabal

Director, Career Development (Saudi Aramco-KSA)

- Dr. Zain Yamani (CENT Director) PLD, RF
- Projects

Lab Utilities

- Lab space
- Instruments
 - Campus



Other Activities/Programs Maintained by CENT

Bi-weekly seminars:

-Al-Somali, Bani-Yaseen, Ahmad Omar, ...etc.

Visiting professors:

- Syed Qadri (NRL,USA)
- Collaborators/ Consultants

Developing CENT labs on campus

Increasing Capacity

Workshops:

- CNT Applications
- X-ray Characterization Techniques

Graduate Program

More inter-Centers collaborations

Collaborations potentially with:

DuPont, Dow Chemicals, S. Aramco, SABIC

KAUST, KACST, KSU, Taibah, KFU,...etc