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3.7.1.1:Number of functional MoUs with institutions/ industries in India and abroad for internship, on-the-job training, project work, student/ facultyexchangeandcollaborativeresearch duringthelast five years

Index-2020-2021

Sr.No.	Yearof signing MoU	Name of the organization with whom MOU/Collaborationbeing signed	Duration	Purpose of MOU/Collaboration	List the actual activities under each MOUyear-wise	PageNo.
1.	2020-2021	MSME Technology Centre, Central InstituteofHand Tools, Jalandhar	Perpetual	Academic and Industrytraining program	Studentsvisit to central institute of Hand and Tools	1
2.	2020-2021	Dayanand College,Ajmer	Perpetual	Agriculture Extenstion activities	VisitofBSc Agricuture students	6
3.	2020-2021	HansRajMahila MahaVidyalaya, Jalandhar	Three years	Academic Collaboration	Guestlecture at HMV by Dr Sapna Sethi	9
4.	2020-2021	Associated Chambers of Commerce & IndustryofIndia (ASSOCHAM), New Delhi	Three years	To promote communication and information exchange through announcmentsin journals, websites and other communication modes.	International Education Leadership and Skill Development Summit.	11
5.	2020-2021	Universityof Allahabad	Perpetual	Research Collaboration	Publication	14

6.	2020-2021	Panjab University	Perpetual	Research Collaboration	Publication	16
7.	2020-2021	Liaoning Technical University	Perpetual	Research Collaboration	Publication	17
8.	2020-2021	NationalInstitute of Technology Srinagar	Perpetual	Research Collaboration	Academic Research	18

- **Functional Activities under MoU:** Department of Mechanical Engineering
- **Organization with which MoU is signed:** MSME Technology Centre, Central Institute of Hand Tools, Jalandhar
- **Name of the institution/ industry visited to:** MSME Technology Centre, Central Institute of Hand Tools, Jalandhar
- **Year of signing MoU and Duration:** 7-Feb-20 and valid till either party is willing to terminate
- **Date of Event:** 28th October, 2021 and **on 23rd November 2022**

Visit to Central Institute of Hand Tools (MSME Tool Room, Jalandhar)

Department of Mechanical Engineering organized one day Industrial Visit at Central Institute of Hand Tools (MSME Tool Room, Jalandhar) on **28th October, 2021** for 5th and 3rd Semester B.Tech. Students to impart practical knowledge in the manufacturing processes and design course. More than 22 students were accompanied by two faculty members Er. Gurdeep Singh and Er. Ved Raj Khullar.

Central Institute of Hand Tools (MSME Tool Room, Jalandhar) is a premier organization responsible for the development of Hand Tool Industry in the country. The institute is ISO-9001:2008, ISO-14001:2004 certified and having NABL accredited Lab. CIHT, Jalandhar imparting Engineering Education in various skill development courses which has greater demand in the industries in the field of Product Design & Development, CAD/CAM, CNC Programming & Machining, Mechatronics/ Automation with PLC, Welding, Electrician and Quality Control etc. and providing services to the Engineering industries in various areas such as Tool Room, Heat Treatment, Testing & Quality Control. Er Vikram Singh conducted a very informative session for the students about the working of CIHT.

Thereafter students interact with the actual industrial personnel of different workshops and asked the question related to the procedures of working of conventional and non-conventional machine. Students feel enthusiastic and motivated for their academic study which is directly linked to the industry. Also, it lets student to know things practically through interaction, working methods and employment practices. Moreover, it gives exposure from academic point of view.

Event Pictures

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StudentsboardingthebustovisitCIHT

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Students boarding the bus to visit CIHT

StudentsvisitingthelabsatC

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Students visiting the labs at CIHT

StudentsvisitingthelabsatCIHT

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Students visiting the labs at CIHT

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StudentsatCIHT campus

One day Industrial Visit & Technology awareness workshop at Central Institute of Hand Tools (MSME Tool Room), Jalandhar on 23rd November 2022

DAV UNIVERSITY STUDENTS VISIT CENTRAL INSTITUTE OF HAND TOOLS

The Department of Mechanical Engineering organized one day Industrial Visit & Technology awareness workshop at **Central Institute of Hand Tools (MSME Tool Room), Jalandhar on** 23rd November 2022 for 2nd and 3rd year B.Tech. students. Students were accompanied by faculty members Dr. M P Garg Dr. Harish Garg, Dr Sharanjit Singh, Er Sumit Nijjar and Er. Ved Raj Khullar.

Central Institute of Hand Tools is a premier organization responsible for the development of Hand Tool Industry in the country. **It is ISO-9001:2008, ISO-14001:2004 certified and has NABL accredited Lab.**

One Day Technology awareness workshop was conducted for DAV University Mechanical students. The curriculum parts they include in the training was:

S.No.	DAY	CURRICULUM
1	1	Tensile Testing, Metal Composition testing of Fe, Calibration of Testing instruments i.e Vernier and micrometer, Measurement of job on coordinate measuring machine

The visit was very fruitful for our students as well as faculty members.

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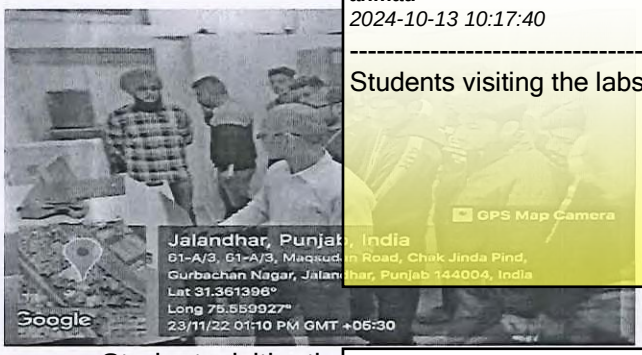
StudentsvisitingtheCIHTcampus

StudentsvisitingthelabsatCIHT



Studentsvisitingthe

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Students visiting the labs at CIHT

StudentsatCIHT campus

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Students visiting the labs at CIHT

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One day Workshop on Mechanical Measurements (23/11/22)
at CIHT, Jalandhar

S.No	Name	Regd NO	Signature
1.			
2.	Subash Kumar Jha	11900769	Subash
3.	Manav	11900734	Manav
4.	Chirag	12000595	Chirag
5.	Chaitanya	12000422	
6.	Bhupinder	12000443	
7.	Vibas	12000202	Vibas
8.	Mandeep	12101348	
9.	Jaspreet Bansal	12100854	
10.	Tejveer Singh	12100320	Tejveer
11.	Parvinder Singh	12100366	Davinder Singh
12.	Rahul	12101339	
13.	Sameer	12100220	Sameer
14.	Avtar Singh	12100247	
15.	Jaspreet Singh	12001478	
16.	Harmanpreet Singh	11900263	
17.	Jasbirat Singh	11900562	
18.	Navdeep Saroay	12000170	
19.	Manindujit Singh	11900491	
20.	Sahil	11900595	
21.	Gagandeep Singh	12101195	Gagandeep Singh
22.	Avanesh	12100184	
23.	Rahul Choudhary	12000049	
24.	Aniket Jakhu	12100650	Aniket
	Dhiraj Kumar	11900653	

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Neel Ray

Rahul
10128
Vikas Bansal

Sameer
10886
9/11/22

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A report on

Activities under MoU No 12

Our University has a Memorandum of Understanding with various organizations to execute the activities for student's welfare.

- **Functional Activities under MoU:** Department of Agriculture
- **Organization with which MoU is signed:** Dayanand College, Ajmer
- **Name of the institution/ industry visited to:** Dayanand College, Ajmer
- **Year of signing MoU and Duration:** 27-Jul-20
- **Date of Event:** 1st April, 2024

Educational tour of BSc (Hons.) Agriculture final year students to DAV Coleege Ajmer

Thirty-one final year students of BSc. (Hons.) Agriculture got an opportunity to visit DAV College, Ajmer on 1st April, 2024.The students visited DAV College, Ajmer which has been a pioneer institute in the field of education since 1887. Our students visited the Agriculture Department and learnt about the various experiential learning programmers' being offered to the students pursuing B.Sc. Agriculture in the institute.

StudentsattendingthesessionatDAVAjmer

StudentsatDAVAjmercampus

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Students attending the session at DAV Ajmer

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Accompanying faculty members

Dr Shabnam Pangtu
Dr Jeenia Thalyari
Dr Ludarmani
Dr Kapil Sharma

List of students

Sr No.	Name of the student	Registration no	Mobile no	Parents mobile no
1.	Diksha	12000531	7814618947	9877744520
2.	Jyoti	12001328	7807861471	9816910154
3.	Vishakha	12000183	9872310838	9041710838
4.	Madhvi	12001359	9876104068	9855704068
5.	Aditi Thakur	12000603	7589444466	7657956779
6.	Puneet	12000877	7814321351	9417845550
7.	Jeevan Jyoti	12000515	7710278805	8968729342
8.	Ashish Mehta	12000216	7006548269	9419226252
9.	Mandeep Kaur	12000521	9041840746	7696116194
10.	Radhika	12001091	7009293930	9417199263
11.	Parul Rajput	12001267	8492004885	8803574330
12.	Ravina	12001397	7876835947	8219026782
13.	Pratham Gupta	12001001	8847637885	7696757885
14.	Vrinda Sharma	12001209	8899541255	7006549737
15.	Simran	12001411	6230277032	9805793232
16.	Sparsh Thakur	12000559	9478841519	6239565660
17.	Mansi	12000196	6284624675	9041450414
18.	Muskan	12001450	7814356501	7347382710
19.	Giriraj	12001081	9988365270	9988426794
20.	Aayush	12000497	8837627764	9996529642
21.	Ankush	12000812	7696530705	9815160869
22.	Priyanshu	12000727	7876629485	7807143658
23.	Vivek	12000040	9896987745	9518861442
24.	Kashish	12000039	8053478003	7876629485
25.	Pallavi	12000419	7009953686	9417720842

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26.	Aditi Mahajan	12000621	9888730324	9780030324
27.	Akanksha	12000168	9779972040	9417328855
28.	Navdeep	12001051	9872433164	9217595291
29.	Pratiksha Thakur	12001493	6283332658	9459090256
30.	Lavita	12000909	6239370024	9872610297
31	Abhishek	12000580	6284018517	9530778068

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A report on

Activities under MoU No 13

Our University has a Memorandum of Understanding with various organizations to execute the activities for student's welfare.

- **Functional Activities under MoU:** Department of Chemistry
- **Organization with which MoU is signed:** Hans Raj Mahila Maha Vidyalaya, Jalandhar
- **Name of the institution/ industry visited to:** HMV College Jalandhar
- **Year of signing MoU and Duration:** 6-Aug-20 and valid for three years
- **Date of Event:** 9th July, 2022

As a part of MoU between DAV University, Jalandhar and Hans Raj Mahila Maha Vidyalaya, Jalandhar, a guest lecture was organized at HMV College Jalandhar. The expert talk was delivered by Dr. Sapna Sethi, Associate Professor, Department of Chemistry on 9th July, 2022. The topic of talk was Unbounding the future with Nanoscience and Nanotechnology. Dr. Sethi discussed the role of nanotechnology and its importance in various areas. She explained in detail the approaches for preparation of nanoparticles, characterization of nanoparticles, different nanomaterials and their applications in various industries like electronics, IT, cosmetics, medicine and healthcare etc. She also talked about the toxicity of nanoparticles and how it has impacted their application in health sector.

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DrSapnaSethireceivingtheplanteratHansrajMahavidyalaya

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Activity 1

ViceChancellorofDAVuniversityrecievingaward

DAV University participated in the 15th International Education Leadership and Skill Development Summit, 2022 organized by Associated Chambers of Commerce and Industry of India (ASSOCHAM) at New Delhi. Dr. J Kackria, Director, DAV University, Dr. Jasbir Rishi, Vice Chancelor, Dr. Ashutosh Sharma, Dr. Yogesh Kumar and Dr. Karan Paul represented DAV University in the Summit. Further, DAV University, Jalandhar has been conferred with "Emerging University of the year" award in the Summit. The award was presented by Honorable Minister of State in the Ministry of Defense and Tourism Sh. Ajay Bhatt. Her excellency Smt. Anandiben Patel, Governor, Uttar Pradesh presided over the function as Chief Guest. Prof. M. Jagadesh Kumar, Chairman, UGC, Prof. Anil D. Sahasrabudhe, Chairman, AICTE addressed the delegates. Vice Chancellor Dr. Jasbir Rishi and faculty members of DAV University received the award. The award was presented in recognition to DAV University's contribution to higher education. The summit was attended by Chancellors, Vice-Chancellors, Principals and the Directors from reputed Government and Private institutions.

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Activity 2

ViceChancellorofDAVuniversityrecievingaward

DAV University participated in the 16th International Education Leadership and Skill Development Summit, organized by Associated Chambers of Commerce and Industry of India (ASSOCHAM) National Council on Education, at New Delhi. Dr. J Kackria, Director, DAV University, Dr. (Prof.) manoj Kumar, Vice Chancelor, Dr. Smriti Khosla, Dr. Gitika Nagrath and Dr. Tejinder Kaur represented DAV University in the Summit. Further, DAV University was honoured with the prestigious Excellence in Serving for Social Causes in Rural Areas award in the summit. The award was given away in the luminous presence of Prof. Anil Sahasrabudhe, chairman, National Assessment and Accreditation Council (NAAC) and National Bureau of Accreditation (NBA), Dr. Pankaj Mittal, Secretary General, Association of Indian Universities (AIU), and Dr. Vinay Sahasrabuddhe, President, Indian Council for Cultural Relations (ICCR). DAV University was recognized for its outstanding initiatives aimed at uplifting the SC community, carried out in collaboration with the Punjab State Council for Science and Technology and the Department of Science and Technology, Government of India. The university embarked on this project in partnership with NIT, Jalandhar. The award also acknowledged DAV University's commitment to identifying and addressing various issues within the adopted villages surrounding its campus. These issues encompassed livelihood frameworks, educational

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qualifications, healthcare facilities, occupational hazards, and agricultural technology. The university is working on several rural development projects that focused on empowering women and making them self-sufficient. The ICICI Foundation collaborated with DAV University in establishing these programmes.

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Lossy mode resonance-based uniform core tapered fiber optic sensor for sensitivity enhancement

Vikas[1], **Keshav Walia**[2] **and R K Verma**[1]

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Abstract

A lossy mode resonance (LMR)-supported fiber optic sensor in which a uniform fiber core is placed among two identical tapered regions, is investigated numerically. Indium tin oxide (ITO) and aluminum-doped zinc oxide (AZO) are considered as LMR active materials used to excite several lossy modes and gold and silver are used as surface plasmon resonance (SPR) active materials. In this probe design, a central uniform core coated with ITO/AZO is the active sensing region, whereas tapered regions are meant for bringing the incident angle close to the critical angle. The sensitivity of the present fiber optic bio-sensor is evaluated for first two LMRs utilizing both ITO and AZO separately, along with its variation with the taper ratio (TR). For ITO, the maximum sensitivity values are observed to be 18.425 μm RIU^{-1} (refractive index unit) and 0.825 μm RIU^{-1}, corresponding to the first and second LMRs, respectively, at a TR of 1.6 and for AZO, equivalent values are 0.79 μm RIU^{-1} and 0.35 μm RIU^{-1}, respectively, at a TR of 2.0. The results illustrate that the first LMR is more sensitive than the second LMR and the ITO-coated probe possesses greater sensitivity than the AZO-coated probe for both LMRs. Similarly, for the fiber optic SPR sensor, the maximum value of sensitivity is 5.6425 μm RIU^{-1}, in the case of gold and 5.0615 μm RIU^{-1} in the case of silver, at a TR of 1.6. Hence, the result shows that the sensor with the present fiber optic probe design has around a 3-fold enhancement in sensitivity compared with conventional SPR sensors. This study will have applications in many sensing schemes where the requirement of large sensitivity is vital.

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Keywords: fiber optic sensors, lossy modes, surface plasmons, indium tin oxide, aluminum-doped zinc oxide, sensitivity

(Some figures may appear in colour only in the online journal)

1. Introduction

In recent years, lossy mode resonance (LMR) technique has been under ample consideration by researchers as it is more effective and beneficial over the surface plasmon resonance (SPR) technique in many sensing applications [1–3]. The first application of LMR, in the area of sensing, was carried out by Dell Villar *et al* in 2010 utilizing indium tin oxide (ITO), both experimentally and theoretically [1]. In LMR-based sensors, lossy modes can be excited by using both transverse magnetic (TM) and transverse electric (TE) polarized light unlike SPR-based sensors, in which only TM polarized light can excite surface plasmons. For LMR to occur, the real part of the dielectric constant of a coated lossy material must be a positive value and greater in magnitude than its own imaginary part, as well as the dielectric constant of the surrounding medium. Owing to the capability of exciting several lossy modes, in LMR-based sensors a metal oxide layer of finite thickness is used instead of metals [3, 4]. Additionally, the spectral position of these resonances can be sought just by varying the thickness of the coated lossy material. Also, the sensitivity values can be attuned as a function of the dielectric

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Optik - International Journal for Light and Electron Optics 225 (2021) 165745

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journal homepage: www.elsevier.com/locate/ijleo

Original research article

Second harmonic generation of laser beam in quantum plasma under collective influence of relativistic-ponderomotive nonlinearities

Keshav Walia [a,*], R.K. Verma [b], Arvinder Singh [c]

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[b] Department of Physics, Central University of Rajasthan, Ajmer, India
[c] Department of Physics, National Institute of Technology Jalandhar, India

ARTICLE INFO

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RP force
Second harmonic yield
Electron plasma wave
Quantum effects

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52.35.Mw
52.38.Dx

ABSTRACT

Second harmonic generation (SHG) of laser beam in quantum plasma under collective influence of relativistic-ponderomotive nonlinearities is explored. Combined influence of relativistic-ponderomotive forces (RP force) causes variation in mass of electrons and background density of electrons thereby producing self-focusing of input beam. Well known paraxial theory is utilized for deriving basic self-focusing equation of input beam. There is creation of density gradients inside plasma under influence of RP force, which results in generation of high frequency electron plasma wave (EPW). Nonlinear coupling between input beam and EPW produces SHG. Numerical simulations are executed in order to have understanding of impact of laser and plasma parameters on beam width of input beam and yield of SHG. Impact of inclusion of ponderomotive nonlinearity and quantum effects on beam width of input beam and yield of SHG is also explored.

1. Introduction

Laser-plasma coupling is immense research topic amongst various research groups worldwide as a result of its significance in various applications including inertial confinement fusion(ICF), super-continuum generation, X-ray lasers, acceleration of charged particles [1–8]. Exploration of laser-plasma interaction physics at intensities exceeding $10^{19} W/cm^2$ has been made possible by advancement in chirped pulse amplification technique (CPA). The behavior of plasma electrons becomes highly nonlinear and completely relativistic at such limit. Nonlinear laser-plasma interaction results in creation of various parametric instabilities including scattering instabilities, self-focusing, two plasmon decay, harmonic generation [9–21]. Therefore, for in-depth knowledge of physics of laser-plasma interaction, investigation of some of these instabilities are desirable.

Self-focusing phenomenon was reported for the first time by Askaryan in 1962[22]. This phenomenon is gaining interest amongst several research groups worldwide on account of its connection with many other nonlinear phenomena. Self-focusing phenomenon arises as a result of nonlinear response of material medium, whenever medium is subjected to electromagnetic (EM) beam. These phenomenon further results in change in dielectric properties linked with the medium. In collisionless plasma, ponderomotive force causes displacement of electrons to off-axial region thereby causing redistribution of carriers. In laser produced plasmas, the phenomenon of harmonic generation is an important nonlinear process. Due to harmonic generation, there is a strong influence on

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PLOS ONE

RESEARCH ARTICLE

In-silico identification and comparison of transcription factor binding sites cluster in anterior-posterior patterning genes in *Drosophila melanogaster* and *Tribolium castaneum*

Anshika Moudgil[1], **Ranbir Chander Sobti**[2], **Tejinder Kaur**[1]*

1 Department of Zoology, DAV University, Jalandhar, Punjab, India, **2** Department of Biotechnology, Panjab University, Chandigarh, India

* tejinder10034@davuniversity.org

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Citation: Moudgil A, Sobti RC, Kaur T (2023) In-silico identification and comparison of transcription factor binding sites cluster in anterior-posterior patterning genes in *Drosophila melanogaster* and *Tribolium castaneum*. PLoS ONE 18(8): e0290035. https://doi.org/10.1371/journal.pone.0290035

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Data Availability Statement: All relevant data are within the paper.

Funding: The author(s) received no specific funding for this work.

Competing interests: The authors have declared that no competing interests exist.

Abstract

The cis-regulatory data that help in transcriptional regulation is arranged into modular pieces of a few hundred base pairs called CRMs (cis-regulatory modules) and numerous binding sites for multiple transcription factors are prominent characteristics of these cis-regulatory modules. The present study was designed to localize transcription factor binding site (TFBS) clusters on twelve Anterior-posterior (A-P) genes in *Tribolium castaneum* and compare them to their orthologous gene enhancers in *Drosophila melanogaster*. Out of the twelve A-P patterning genes, six were gap genes (*Kruppel*, *Knirps*, *Tailless*, *Hunchback*, *Giant*, and *Caudal*) and six were pair rule genes (*Hairy*, *Runt*, *Even-skipped*, *Fushi-tarazu*, *Paired*, and *Odd-skipped*). The genes along with 20 kb upstream and downstream regions were scanned for TFBS clusters using the Motif Cluster Alignment Search Tool (MCAST), a bioinformatics tool that looks for set of nucleotide sequences for statistically significant clusters of non-overlapping occurrence of a given set of motifs. The motifs used in the current study were Hunchback, Caudal, Giant, Kruppel, Knirps, and Even-skipped. The results of the MCAST analysis revealed the maximum number of TFBS for Hunchback, Knirps, Caudal, and Kruppel in both *D. melanogaster* and *T. castaneum*, while Bicoid TFBS clusters were found only in *D. melanogaster*. The size of all the predicted TFBS clusters was less than 1kb in both insect species. These sequences revealed more transversional sites (Tv) than transitional sites (Ti) and the average Ti/Tv ratio was 0.75.

Introduction

To know the development processes occurring in metazoans, it is vital to comprehend the regulatory mechanics of the underlying transcriptional network. The genomic sequence of an organism contains a significant amount of information that specifies how and when genes will be expressed. Despite the availability of genome sequences for many metazoans, very little is known about how this biological data is encoded [1, 2]. Previous research on the early

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Cite this: *RSC Adv.*, 2024, **14**, 12265

Investigation into the impact of CeO_2 morphology regulation on the oxidation process of dichloromethane

Hao Wu,[ab] Xiaoliang Zhao,[b] Jian Li,[a] Bandna Bharti,[c] Yuling Tan,[a] Hongyan Long,[a] Jiuhu Zhao,[d] Gang Tian[a] and Fan Wang *[a]

Four distinct CeO_2 catalysts featuring varied morphologies (nanorods, nanocubes, nanoparticles, and nano spindle-shaped) were synthesized through a hydrothermal process and subsequently employed in the oxidation of dichloromethane (DCM). The findings revealed that the nano spindle-shaped CeO_2 exhibited exposure of crystal faces (111), demonstrating superior catalytic oxidation performance for DCM with a T_{90} of 337 °C and notably excellent low-temperature catalytic activity (T_{50} = 192 °C). The primary reaction products were identified as HCl and CO_2. Through obvious characterizations, it showed that the excellent catalytic activity presented by CeO_2-s catalyst might be related to the higher oxygen vacancy concentration, surface active oxygen content, and superior redox performance caused by specific exposed crystal planes. Meanwhile, CeO_2-s catalyst owned outstanding stability, reusability, and water inactivation regeneration, which had tremendous potential in practical treatment.

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rsc.li/rsc-advances

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1 Introduction

Volatile Organic Compounds (VOCs) possess a multifaceted composition, undergoing decomposition upon exposure to light, thereby generating free radicals and peroxyl radicals. These radicals serve as pivotal precursors for the production of ozone and fine particulate matter, posing a substantial threat to the environment.[1] Concurrently, VOCs are known to inflict severe damage on the human respiratory, nervous, and immune systems.[2,3] Notably, chlorinated volatile organic compounds (CVOCs) are characterized by high toxicity, volatility, and resistance to degradation, emerging as significant pollutants with detrimental impacts on ecological ecosystems and human health.[4] DCM, a representative CVOCs, finds widespread application as an organic solvent in sectors such as pharmaceuticals, spray coating, and rubber manufacturing.[5] Urgency surrounds the imperative to fortify DCM treatment strategies. Common approaches for conducting the treatment of CVOCs encompass adsorption, absorption, condensation, combustion, low-temperature plasma, and catalytic oxidation.[6,7] Catalytic oxidation, propelled by a catalyst, efficiently and comprehensively converts CVOCs into relatively non-toxic substances, including H_2O, CO_2, and HCl, with minimal energy consumption. It has evolved into the predominant technology applied in the CVOCs treatment sector in both China and internationally.[8] Consequently, the preparation of catalysts that are efficient, stable, and cost-effective assumes paramount significance in enhancing the competitiveness of this technology. While precious metal catalysts boast merits such as a low ignition temperature, high activity, and elevated HCl selectivity, their scarcity contributes to prohibitively high costs. Furthermore, the vulnerability of catalyst surfaces composed of precious metals to carbon deposition, coupled with the adsorption of chlorine from CVOCs onto active sites, leads to the phenomenon of chlorine poisoning, ultimately culminating in catalyst deactivation subsequent to chlorine deposition.[9,10] In recent years, non-precious metal catalysts have garnered extensive scholarly attention in China and globally due to their relatively high activity, cost-effectiveness, and resilience against chlorine poisoning.

In addition, nanomaterials have unique physical, chemical and biological properties that make them promising for a wide range of applications in catalysis. Atul S. Nagpure *et al.*[11] studied the catalytic transfer hydrogenation of 5-hydroxymethylfurfural (HMF) to 2,5-dimethylfuran (DMF) and furfural to 2-methylfuran (MF) using 2-propanol as hydrogen source on nitrogen-doped mesoporous carbon (NMCs) supported Ru, Pd and Au metal catalysts. It was shown that highly dispersed Ru nanoparticles loaded on NMC exhibited excellent catalytic performance for the conversion of HMF to DMF and furfural to MF in the CTH reaction. This is mainly attributed to the smaller nanoparticle size of Ru (1.9 nm) and the good interaction between the metal and the carrier. Zhu *et al.*[12] used $Cs_3Sb_2Br_9$

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Study Protocol

Research and Industrial Test of Anti-Freezing and Dust Suppression Agent for Truck Roads in Open-Pit Mines in Inner Mongolia, China

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Abstract: To effectively resolve the inherent conflict between dust control and ice prevention on truck roads during North Surface Coal Mine winters, initially, via monomer preference experiments, the optimal monomers for wetting, moisturizing, and condensing functions were identified as sodium dodecylbenzene sulfonate (B), glycerol (N), and polyacrylamide (R). In parallel, through compound synergistic experiments, the constituent elements of an anti-freezing agent were determined, referred to as F. Subsequently, a four-factor three-level orthogonal test was conducted employing the monomers B, N, R, and the anti-freezing agent F. This evaluation focused on four principal control parameters: penetration rate, evaporation resistance, viscosity, and freezing point. The results led to the identification of the optimal antifreeze and dust suppressant formulation, designated as B2N3R1F3. Within the North Open-Pit Coal Mine, the self-developed dust suppressant was applied to the field test section. Multiple parameters were examined for 6 consecutive days, encompassing the water content of the pavement geotechnical soil, the concentrations of total dust and exhaled dust, and the particle size distribution of dust within this road section. The field test results show that: the average water content of the road surface within the dust suppressant test section measured at 12%; the dust reduction efficiency of total dust and exhaled dust is 93% and 91%; the proportion of dust particles with a size exceeding 500 μm increased by 54.6%. These comprehensive findings provide a empirical framework for the effective resolution of the practical challenge of simultaneously managing dust control and frost protection on truck roads within surface coal mines.

Keywords: surface coal mines; roads; antifreeze and dust suppressants; orthogonal tests; industrial tests

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1. Introduction

Road dust emissions resulting from the movement of trucks represent the predominant source of particulate pollution within open-pit mining operations, contributing significantly to the overall dust load, accounting for a substantial portion, often between 70% and 90% [1]. This dust exhibits unique characteristics owing to the mechanisms involved, including tire-induced particle release, centrifugal dispersion, and negative pressure-induced airflow. Consequently, road dust displays high mobility and a pronounced degree of dispersion into the surrounding environment [2,3]. The ingress of dust into the interior of transport equipment not only compromises its operational efficiency but also necessitates more frequent maintenance cycles. Furthermore, the elevated dust concentration has adverse consequences, not only diminishing road surface visibility but also escalating health risks, including pneumoconiosis and cancer, particularly concerning the well-being of truck drivers [4,5].

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Research on chlorine salt antifreeze road dust suppressants for open-pit coal mines

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ABSTRACT

In addressing the significant challenge of trucking road dust emanating from open-cast coal mines, the prevalent method of conventional water sprinkling for dust removal on transport roads has proven suboptimal. This inadequacy is attributed to the pronounced mobility of truck transport roads, substantial dust loads, and extensive open dust sources. Particularly in cold mining regions, the use of water in winter exacerbates the issue by causing icy road surfaces, thereby increasing the risk of truck skidding and overturning, posing a severe hazard to both mine safety and the well-being of truck drivers. A pragmatic imperative exists to devise a solution that effectively addresses both anti-freezing and dust suppression in open-pit coal mine roads, while minimizing corrosive impact. Against the backdrop of Hebei Open-pit Coal Mine in Huolin, Inner Mongolia, this study focuses on the development of a chloride salt antifreeze-type road dust inhibitor tailored for open-pit transportation roads. The proprietary anti-freezing dust suppressant achieves a freezing point as low as −36.4 °C, exhibiting corrosion efficiency merely at 56.5% of that of water. Notably, the effective dust suppression duration surpasses that of water by a factor of 150, resulting in a 53% reduction in dust suppression costs. This innovation is specifically applicable to high-cold and arid surface coal mines in northern regions and similar mining contexts. It offers technical support for the establishment of environmentally sustainable practices in surface coal mines, representing a pivotal step toward the realization of green mining initiatives.

1. Introduction

In the contemporary Chinese coal mining landscape, open-pit operations have assumed a central role in coal extraction (Rongxiao et al., 2023; Wen et al., 2023; Alexander et al., 2023). This prominence has concurrently heightened concerns regarding dust accumulation in open-pit coal mines, necessitating a thorough investigation into both domestic and international dust suppression methodologies (Fangwei et al., 2022; Wen et al., 2022). Various formulations of road dust suppressants have been innovated, including bonded formulations (Wenjin et al., 2023), moisture-absorbing varieties (Wang et al.2017; Wang et al.2014; Zhao et al.2023), and biological alternatives (Xiang-Ming et al., 2023; Ming et al., 2022). In the northern regions of China, characterized by winter temperatures frequently dropping to minus 30 °C or lower, the application of road dust suppressants has given rise to a notable occurrence of road icing. This phenomenon poses a substantial hazard to transportation vehicles, rendering them prone to skidding and rollovers, thereby adverse mine safety and significantly impeding winter production efficiency (Gang et al., 2022; Zhang et al., 2018; Zhou et al., 2018).At present, the main components of anti-freezing road dust suppressants are chlorine salts (Subbir et al., 2021; Gang et al., 2022), which are inexpensive and easy to formulate, but the chlorine salt solution will form a primary cell structure with the metal it comes into contact with, leading to great corrosion of the metal that acts as the negative pole (Zhi et al., 2023; Zidong et al., 2021; Xiaoliang et al., 2021). The chassis and rotating axle of open pit mine transportation trucks are metal structures, if they are in contact with chlorine salt solution for a long time, the transmission mechanism will suffer great damage, reducing the truck overhaul interval and lowering its service life, which will cause serious potential economic losses to the open pit

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The seasonal characterization and source analysis of water-soluble inorganic ions in $PM_{2.5}$ in Fuxin, northeast China

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ABSTRACT

In Fuxin, a few existing studies have illustrated the pollution characteristics of water-soluble ions (WSIIs) in $PM_{2.5}$ in four seasons. To track the particulate pollution in Fuxin, sample filters of $PM_{2.5}$ in the four seasons of spring, summer, autumn and winter in 2019 were collected. For the first time, the concentration and seasonal variation characteristics of $PM_{2.5}$ and WSIIs were tested by gravimeter method and ion chromatography. Characteristics of WSIIs and their existence sources and forms were explored by ion balance calculation, correlation analysis and principal component analysis. The annual average concentrations of $PM_{2.5}$ and WSIIs were (33.23 ± 13.03) $\mu g \cdot m^{-3}$ and (22.86 ± 9.62) $\mu g \cdot m^{-3}$, respectively. The seasonal WSIIs concentration followed the order: spring ($29.98\ \mu g \cdot m^{-3}$) > autumn ($28.85\ \mu g \cdot m^{-3}$) > winter ($21.32\ \mu g \cdot m^{-3}$) > summer ($11.28\ \mu g \cdot m^{-3}$). In WSIIs, 81.41% of them were secondary inorganic ions (SO_4^{2-}, NO_3^-, and NH_4^+), contributed about 68.80% to $PM_{2.5}$, and the chemical forms were mainly $(NH_4)_2SO_4$ and NH_4NO_3. In this study, it has been revealed that $PM_{2.5}$ samples exhibited acid properties in spring and autumn while, displayed alkalinity in summer and winter. The average value of NO_3^-/SO_4^{2-} was 0.67, so from these data it can be illustrated that fixed pollution sources were found to be dominant over mobile sources in Fuxin. The main identified sources of WSIIs in four seasons in Fuxin were sea salt particles and secondary particles, respectively. These results showed that the geographical factors of Bohai Bay and secondary transformation had a significant impact on the concentration of WSIIs of $PM_{2.5}$ in Fuxin.

KEYWORDS

Water-soluble ions; $PM_{2.5}$; gravimeter method; seasonal variations; Fuxin City

1 Introduction

The World Health Organization (WHO) estimated that total global mortality due to air pollution was 7 million in 2012. Particulate matter (PM), especially $PM_{2.5}$ (particulates with a size of 2.5 μm or less), has become one of the largest contributors to air pollution (Feng et al., 2018). Among the various components, water-soluble ions (WSIIs) are the most predominant species of $PM_{2.5}$, accounting for 23–80% (Calvo et al. 2013; Liu et al., 2017). The atmospheric acidification and climate changes are caused by, WSIIs, which are extremely harmful to human nervous, cardiovascular system and respiratory system (Wang et al., 2015; Yao et al., 2003; Calderon Garcidueñas et al., 2011; Tien et al., 2021). In addition, as major components of WSIIs, secondary inorganic ions (NO_3^-, SO_4^{2-}, and NH_4^+) could exacerbate a reduction in visibility and promote the formation of haze due to their aerosol hygroscopicity (Tian et al., 2015; Wang et al., 2015; Qiao et al. 2019). Thus, many studies in Asian countries have ranked the emission of SO_2, NO_x, NH_3 and mineral dust among the top issues (Kima et al., 2007; Lu et al., 2021). Concentrations of these emissions are greatly influenced by meteorological factors, geographic conditions and emission sources as reported in various studies (Hu et al., 2019; Ding et al. 2019, He et al. 2014; Li et al. 2003). Therefore, it is very requisite to understand the concentrations and compositions of WSIIs in typical ecological fragile area of Fuxin.

Fuxin (42°10′N, 122°00′E) is located to the east of Hu Line, an important atmospheric channel, connecting the northern Horqin sandy land with the southern Bohai Bay. As a coal resource-based city in the north,

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