Az indiai projektpartner látogatása a TTK-ban

Az magyar-indiai TéT együttműködés keretében a Tezpur Egyetem Energia Tanszékének vezetője, professzor Dhanapati Deka (PI) és a projekten dolgozó Ms. Aparna Rani Seal PhD hallgató 2024. január 28 és február 4 között meglátogatta az Természettudományi Kutatóközpont Anyag- és Környezetvédelmi Intézetében tevékenykedő Megújuló Energia kutatócsoportot. Találkozott Dr. Rosenbergerné Mihályi Magdolna projektvezetővel, a projekten dolgozó többi kutatóval, Prof. Valyon Józseffel, Prof. Lónyi Ferenccel, Dr. Novodárszki Gyulával, Dr. Barthos Róberttel és Dr. Szegedi Ágnessel, valamint a csoport többi tagjával. Az indiai kutatók megtekintették az Intézet laboratóriumi létesítményeit.

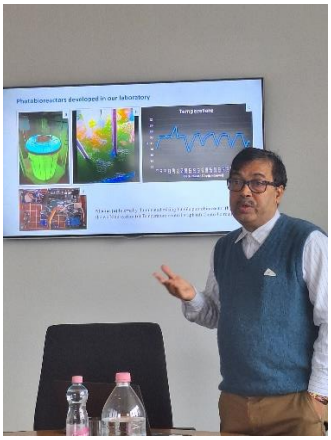
A magyar és az indiai partner áttekintette a projektévben elért eredményeket. Megvitatták továbbá az indiai laboratóriumban, hulladék biomasszából kifejlesztett lignin depolimerizáló katalizátor TTK-ban végzett fizikai-kémiai jellemzésének eredményeit. A nemzetközi folyóirathoz benyújtott közös kézirat anyagát is megvitatták. Megállapították, hogy a kitűzött célokat eredményesen valósították meg. Diszkutálták a további együttműködés lehetséges formáját. Sikeres látogatásukat az engedélyezett 4. munkaszakaszban fejezték be.

Az indiai kutatók az Anyag- és Környezetkémiai Intézet kutatói és PhD hallgatói előtt szemináriumi előadás keretében számoltak be eredményeikről 2024. február 1-jén, az alábbi témakörben:

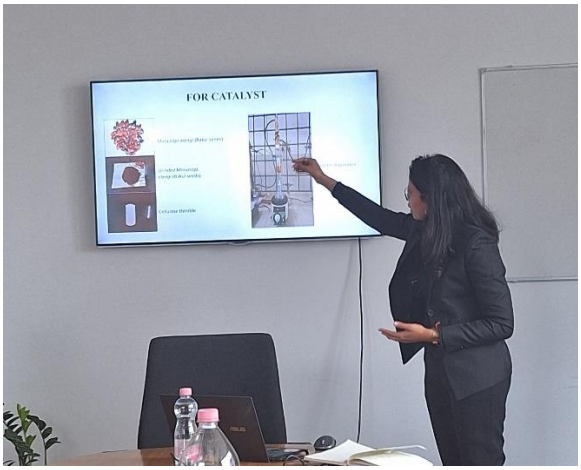
Professor Dhanapati Deka: Automated Modular Photobioreactor with Harvester (AMPH): a microalgae cultivation system.

Ms. Aparna Rani Seal: Lignin Recycling for Value-Added Global Products.

Az intézeti szemináriumon a projekt magyar ipari partner, a 3R vállalkozás vezetője, Edward Someus is részt vett. A szemináriumot követően a három projekt partner áttekintette a projekt eredményeit és megbeszélték a jövőbeni további együttműködés lehetőségét. A személyes találkozó tovább mélyítette a partnerek közötti szakmai és emberi kapcsolatot.



Az indiai projektvezető Professzor Dhanapti Deka előadása a TTK AKI szemináriumán 2024. február 1-jén.



A projekten dolgozó Ms. Aparna Rani Seal PhD hallgató előadása a TTK AKI szemináriumán 2024. február 1-jén.

A három projektpartner és munkatársa Budapesten a TTK AKI szemináriumán, 2024. február 1-jén. Balról jobbra: Dr. Valyon József emeritus professzor, a magyar vállalkozó partner Edward Someus, az indiai vezetőkutató Prof. Dhanapati Deka, a projekt magyarországi vezető kutatója Dr. Rosenbergerné Mihályi Magdolna, Ms Aparna Rani Seal PhD hallgató és Dr. Novodárszki Gyula tudományos munkatárs.

Alább található az előadások összefoglalója és az előadók rövid önéletrajza.

Automated Modular Photobioreactor with Harvester - a commercial scale microalgae cultivation system

Prof. Dhanapati Deka

Department of Energy, Tezpur University

Microalgae biomass is a renewable feedstock capable of replacing petroleum in terms of energy production as well as for the production of petrochemicals. In the process, microalgae have the added benefit of being a carbon sequester and help companies with their Net Zero goals. However, cost and mass production are the primary hindrance making microalgae technology unsustainable. This article describes a microalgae culture system called Automated Modular Photobioreactor with Harvester (AMPH) being under development in our laboratory. AMPH is autonomous, compact, modular, and has low maintenance, making sustainable industrial-scale microalgae production feasible. The AMPH is designed to tackle the issues of biofouling,

temperature control, improper mixing of the culture media, contamination, low biomass productivity and poor mass/gas transfer faced by conventional microalgae culture systems. Any renewable energy source can power the AMPH, enabling the production of industry-standard microalgae biomass in a centralized or decentralized manner. The modular design and its autonomous operation allow AMPH to be used by different users like biofuels to pharmaceuticals companies with ease. Using low-cost solar energy along with automated operation AMPH aims to produce microalgae feedstock at as low as 20-30 ₹/kg. AMPH will revolutionize bio-refineries and become crucial in carbon capture and mitigating global warming.

Lignin depolymerization using renewable heterogeneous catalyst

Aparna Rani Seal

Department of Energy, Tezpur University

A renewable heterogeneous catalyst has been prepared using Mimusops elengi seeds. The DOCW left after the removal of oil from seed were calcined in muffle furnace at 500°C for 1hr to obtain Mimusops elengi-derived activated carbon (MeAC). Sulfonation of the MeAC was achieved using H_2SO_4 resulting in sulfonated MeAC or MeAC-SO3H. This integrated approach emphasizes both the utilization of biomass-derived feedstock and the sustainable preparation of catalysts for lignin valorization. Sawdust-derived isolated Klason lignin and subjected to depolymerization using the Mimusops elengi sulfonated activated carbon catalyst under controlled conditions in a hydrothermal autoclave. The successful depolymerization can be evident by the significant reduction of the molecular weight and the generation of low-molecular lignin fragments. Isolation of lignin from sawdust and CC by Klason method is characterized by elemental analysis, XRD analysis, thermo-gravimetric analysis (TGA) , UV-vis spectroscopy, ATR spectroscopy, solid state ^{13}C NMR. Characterization of MeAC-SO3H is done by, Energy Dispersive spectroscopy (EDX), X-Ray Diffraction, Fourier-transform infrared spectroscopy (FTIR), Scanning electron Microscope (SEM), transmission electron microscope (TEM) analysis and thermo-gravimetric analysis (TGA). Further, analysis of the reaction mixture is obtained by gas chromatography-mass spectrometry (GC-MS) and CHN analysis. Thus, the obtained results contribute to the understanding of lignin depolymerization mechanisms and pave the way for the sustainable production of valuable bio-based products from lignocellulosic sources.

Brief Biodata of Professor Dhanapati Deka

Prof Dhanapati Deka, FRSC currently serves as a full professor, Department of Energy and the Dean, Research and Development, Tezpur University, Tezpur, Assam. He has been associated with Tezpur University, one of the prestigious universities in India funded directly by the federal government, for the last 30 years and serving the university in various senior positions. He has published 76 peer reviewed research articles in high impact factor international journals where most of his research papers have impact factors more than 8. He is also credited with one patent, one book, and 8 book chapters. He has already guided 12 PhD students and 6 students are working at present on various biomass conversion to energy and application related topics. His current citation Index in google scholar is 3461 and h-index is 29. He has successfully completed 6 (six) numbers of sponsored research projects out of which, three were International collaborative projects viz. Indo-Hungarian (2016-19), Indo-Brazil (2016-19) and Indo-Finnish (2011-14). At present, second project with Hungarian counterpart is in active implementation. Dr. Deka has received a good number of awards /distinctions from different recognized bodies. He has visited different countries for academic purposes including USA, Spain, Brazil, Sweden, Finland, and Hungary. He has been involved in multidisciplinary research activities with various prestigious institution in India and Abroad. In recognition of his close association with Chemistry related research works, he has been admitted as FRSC by the Royal Society of Chemistry, London in July,2023.

Biodata of Aparna Rani Seal

Aparna Rani Seal is a dedicated scholar currently pursuing her Ph.D. in Energy at Tezpur University. Born on 07/10/1996, she completed her senior higher secondary in 2014 and subsequently earned a Bachelor's degree in Chemical Engineering in 2019, with a focus on research in PVDF membranes. Recognized for her academic excellence, Aparna received a gold medal for her outstanding performance in Energy Technology during her MTech. in 2022 with her research work on green synthesis of catalyst for conversion of waste cooking oil to biodiesel. Currently in her second semester of Ph.D., Aparna's research delves into the conversion of lignocellulosic biomass into valuable products. Her work not only aligns with global efforts towards sustainable energy but also contributes to addressing critical challenges in biomass conversion. Aparna Rani Seal's journey reflects a commitment to academic excellence and a dedication to advancing sustainable practices for a greener and more efficient future.