NEWS LETTER
JULY - MARCH 2025

AMRITA TEC
DST-AMRITA
**TECHNOLOGY ENABLING CENTRE**

Technologies Developed

Bio-Photovoltaic Device Utilizing Freshwater Macroalgae
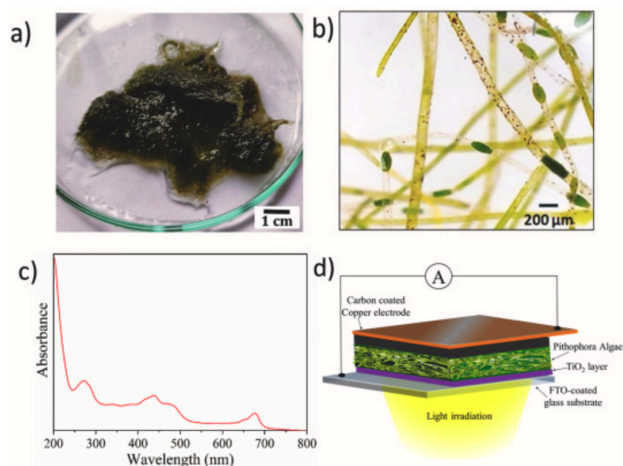
A simple bio-photovoltaic device was fabricated using filamentous macroalgae Pithophora roettleri as the photoactive material. The device consisted of an algal biofilm sandwiched between activated carbon-coated copper (Cu) and TiO_2-coated FTO glass slides. The optimized 1 cm² device generated a short circuit photocurrent of 10.19 µA and an open circuit photovoltage of 0.35 V under white light (100 mW/cm²), and 1.25 mA and 0.5 V under UV light (365 nm, 20 mW/cm²). Ten devices connected in series produced 5.53 V under natural sunlight at 0.6 Sun intensity.

MzDOCK: Multiple Ligand Docking Tool - Advanced Molecular Docking Virtual Screening Tool for Drug Discovery Research
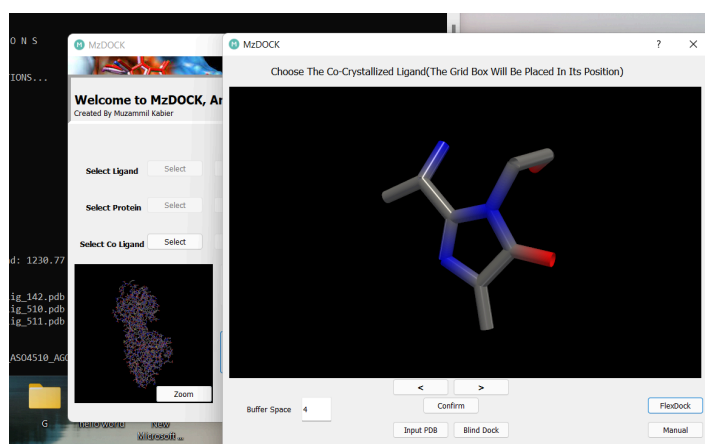
MzDOCK is an advanced molecular docking tool streamlining drug discovery with support for multiple ligand formats, side chain flexibility, and virtual screening. Compatible with PyMOL and JSME Editor, it enables binding site configuration and detailed interaction analysis. Integrated forcefields enhance precision, while ongoing additions like ML-based QSAR, RetroScheme, OpenFieldAI, and EZPrimer expand its capabilities, making it a powerful suite for structure-based drug design and computational research.

Technologies Commercialised

Amrita TEC Empowers Kerala's Cashew Industry Through Innovation

To address key challenges in cashew processing—labor shortages, high costs, and reduced global competitiveness—the Kerala Cashew Cluster approached DST Amrita TEC. Traditional manual grading methods were inefficient and costly. In collaboration with MAKS Automation, Amrita TEC developed and commercialized an automated cashew grading machine with MSME Ministry support. This innovation improves sorting accuracy, reduces labor dependency, and boosts productivity, empowering the cashew industry for global competitiveness and sustainable growth. As a mark of recognition, a plaque was presented to Shri G.S. Prakash IEDS, Joint Director, MSME-DI Thrissur, by Sri Mata Amritanandamayi Devi, Chancellor of Amrita Vishwa Vidyapeetham.

A Sustainable Boost for Kerala's Indigenous Paddy Processing

To support traditional rice varieties like Navara, Pokkali, and Gandhakasala, Amrita TEC developed a customized paddy dryer with hybrid heating technology. Integrating solar, wood, and electric systems, the dryer ensures uniform drying, reduces breakage, and retains nutritional value—ideal for Kerala's humid climate. The innovation was successfully commercialized

with Puthanchira Kuthari Rice Mill during the MSME Vendor Development Programme in Thrissur on December 4, 2024. Shri G.S. Prakash, Deputy Director, MSME-DI, lauded the initiative for advancing productivity and preserving Kerala's paddy heritage.

Industry Collaboration opportunities

Automation of Feeding System and Safety Mechanism in Rubber Reclamation Industry

Rubber reclaimed from worn-out tires is used in industries such as rubber mats, tyre retreading, and automotive parts manufacturing. The current production process involves manually feeding two small rubber mixing mills operated by four workers. To expand operations, a larger mixing mill is being introduced, but manually feeding this new mill presents challenges, especially since the process requires repeated feeding of cooked rubber crumbs in 3–6 cycles per batch. Each batch consists of 3,500 kg of material at temperatures ranging from 200°C to 240°C. A high-temperature automated material handling solution is required to efficiently feed and refeed the new mill. The system should include automated feeding with rate control, a recirculation mechanism for repeated cycles, emergency stop buttons and safety sensors, and programmable controls to manage feeding cycles, roller gap settings, and material flow. The aim is to ensure consistent quality with minimal manual intervention.

Automating Coir Yarn Production for High-Strength, Low-Waste Output with Precision Performance

Uneven coir twist

The coir industry is struggling due to outdated spinning machines that cannot produce fine, high-strength yarn (target: 300 meters/kg) essential for premium floor coverings. This has led to a decline in international demand for coir-based wall-to-wall carpets. Existing machines also produce inconsistent two-ply yarn, resulting in 15–20% raw material wastage in PVC tufting mats and increased labor costs for manual removal of defective yarn. There is an urgent need for a next-generation coir spinning machine with advanced automation and precision controls. The new system should enable the production of thinner, high-strength yarn to rejuvenate the floor covering market, generate uniform two-ply yarn to reduce waste, and eliminate the lead thread to improve cost-efficiency, particularly for geo-textile applications. A technology upgrade is vital to reduce production losses, enhance efficiency, and regain global competitiveness for India's coir industry.

Coir Tufting Waste: From Environmental Burden to Sustainable Opportunity

Coir tufting processes in Tamil Nadu and Kerala generate 4–5 tons of non-biodegradable waste daily from around 150 PVC tufting machines. This trimming waste, currently dumped in landfills, poses serious environmental risks and wastes valuable raw materials. With no existing recycling mechanism, the industry faces growing scrutiny for unsustainable practices.

There is an urgent need for R&D-driven solutions to convert this waste into eco-friendly products such as wooden pallet substitutes, pavement tiles, and compressed coir boards for furniture and construction. A circular economy approach can reduce landfill pollution, create new revenue streams, and enhance the coir industry's sustainability. A structured waste-to-product model will also position Indian coir manufacturers as global leaders in green, fiber-based innovation.

Stain-Free Coir Mats: A Call for Scientific Intervention
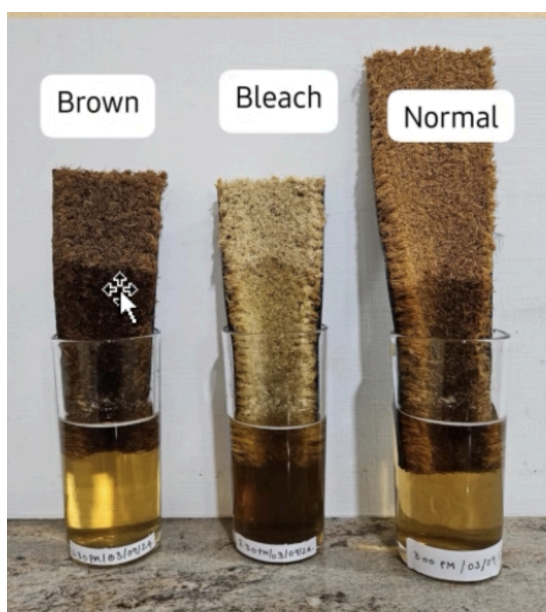
Coir mats are increasingly rejected in global markets—especially in the USA and Europe—due to tannin bleeding that causes staining when exposed to moisture. This issue arises from modern processing methods that skip traditional retting, which naturally removes tannins. Internal tests confirm significant color bleeding across all coir fiber types, rendering them unfit for premium exports. Urgent R&D interventions are essential, including eco-friendly retting methods, anti-bleed coatings, water-resistant barrier treatments, and alkaline pre-treatments to neutralize tannins. Without immediate action, coir mats face the risk of blacklisting, threatening India's export reputation and revenue in the global coir market.

Outreach for Technology Enablement through Industry–Academia–Government Collaboration via TEC
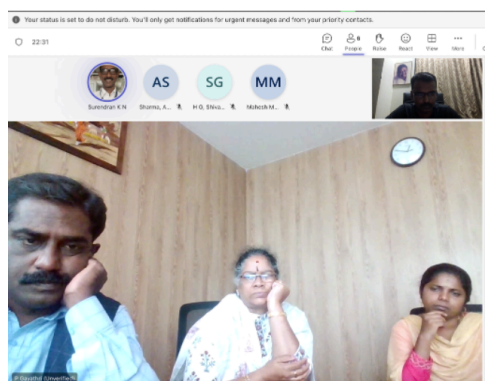
Amrita Technology Enabling Centre (TEC) engaged with SIDBI to explore collaborative funding models for scaling MSME-focused innovations. The discussion addressed key MSME challenges like high operational costs and limited automation access, aiming to support cost-effective technology adoption through soft loans and financial aid.

Amrita Technology Enabling Centre (TEC) is initiating collaborations with Bharatiya Kisan Sangh and Jai Kisan Nidhi in Kerala to promote technology-driven farming. The focus includes IoT-based monitoring, sustainable practices, and farmer training on modern techniques and value addition.

DST-Amrita Technology Enabling Centre (TEC) held a meaningful interaction with the Ministry of Jal Shakti, highlighting its efforts in technology transfer, industry-academia collaboration, and sustainable innovation.

Amrita TEC participated in IBM Gen-AI conclave or engagement and connected with various stakeholders for TEC activities. In two-day international Gen AI Conclave Amrita TEC gained valuable insights into the latest advancements in Generative AI, its scalability across sectors, and the importance of government initiatives in fostering AI ecosystems.

Amrita Technology Enabling Centre (TEC) actively participated in RENERGY Coimbatore 2024, held at the Codissia Trade Fair Complex. Amrita TEC's engagement facilitated valuable networking opportunities, fostering the development of the technology ecosystem through interactions with industry experts and stakeholders.

Amrita Technology Enabling Centre (TEC) actively participated in the TEC Connect & Convergence event organized by KIIT Technology Enabling Centre (KIIT-TEC) at KIIT University, Bhubaneswar. This symposium served as a collaborative platform, bringing together academia, industry, and government stakeholders to address technological challenges and explore innovative solutions.The forum facilitated networking with TECs across the country, enabling the exchange of best practices and collaborative strategies to enhance the technology development ecosystem.

Amrita Technology Enabling Centre (TEC) successfully organized an outreach activity by exhibiting a stall at the India International Industrial Expo (IIIE) 2024, held from December 13 to 15, 2024, at the KINFRA International Exhibition Cum Convention Centre, Kochi, Kerala. Amrita TEC's stall served as a platform to showcase its ecosystem, ongoing projects, and technology-driven solutions, fostering networking opportunities and facilitating discussions with stakeholders for collaborations in technology development.

Amrita Technology Enabling Centre (TEC) actively participated in the two-day Vendor Development Programme organized by the MSME Development and Facilitation Office (MSME DFO) under the Ministry of MSME, Government of India, held on December 4, 2024, at the Golden Jubilee Hall, MSME DFO, Thrissur. The event witnessed the participation of approximately 400 Micro and Small Enterprises (MSEs) and 30 Public Sector Undertakings (PSUs).

A productive discussion was held with Mr. T. K. Karupannaswamy, Managing Director of Barani Hydraulics, where Dr. Krishnashree Achuthan, Director of Amrita Technology Enabling Centre (TEC), and Dr. Sasangan Ramanathan, Dean & HoS, School of Engineering, Coimbatore, actively participated. Mr. Karupannaswamy provided an in-depth presentation on Barani Hydraulics' journey, highlighting its unique Servo Hydraulic Technology and contributions across 145 industry sectors, including their patented High-Pressure High-Temperature diamond-making machine and self-learning AI-enabled ceramic industry machinery. The meeting laid the foundation for a robust

partnership aimed at driving technological innovation, sustainability, and industrial advancements.

A European Union delegation visited the Amritapuri campus, where Amrita and Amrita TEC explored partnerships in AI, renewable energy, healthcare, and sustainability. Led by the EU's Head of Research & Innovation, discussions focused on collaboration and funding opportunities through platforms like the Enterprise Europe Network (EEN). The delegation also met with Chancellor Mata Amritanandamayi Devi to exchange ideas on sustainability and humanitarian values. Amrita TEC highlighted its ongoing efforts in technology transfer, industry-academia collaboration, and innovation-led outreach.

Events, Training Program & Webinars Organised

Dr. Prashanth Nair presented Amrita TEC's technology commercialization initiatives at National Conference on Recent Trends in Science and Technology NCRTST 2024, highlighting support for pre-incubation and innovation enablement.

Dr. Prashanth Nair conducting a seminar on TRL and project mapping for faculty at KPR Institute of Engineering & Technology, organized by Amrita TEC.

Amrita Vishwa Vidyapeetham hosted webinars on advancing blockchain security through run-time verification and the impact of Generative AI on businesses. The sessions covered secure smart contracts, real-time issue detection, AI-driven opportunities, and the importance of ethical technology adoption

Pravichi TEC Ecosystem Awareness Program.

Pravichi is an awareness and outreach initiative by the DST-Amrita Technology Enabling Centre (TEC) aimed at promoting technology enablement, industry-academia collaboration, and innovation-driven problem solving across diverse sectors. The program is designed to create awareness about the TEC ecosystem and its services, while actively engaging MSMEs, startups, farmer groups, and industry bodies with researchers and innovators. Pravichi facilitates the identification of sector-specific challenges and supports the co-development of tailored technology solutions. It also enables technology scouting, prototype development, intellectual property support, and access to funding, empowering stakeholders to drive sustainable growth through research-backed industrial innovation.

Pravichi at Saintgits College of Engineering, Kottayam District

Pravichi at Perumbavoor Ernakulam District

Pravichi for member of Junior Chamber International

Pravichi for members of Bharatiya Kisan Sangh

Industry Academia Training Program on Transforming Indian Textile Industry

Amrita Technology Enabling Centre, in collaboration with Tiruppur Exporters Association (TEA), Fairtrade India, Centre for Social Markets (CSM), and ASU, organized a program on "Transforming the Indian Textile Industry" at Tiruppur, focusing on technology commercialization, sustainability, and circularity. The event featured engaging sessions, including collaborative ideation and team exercises,

enabling participants to explore industry challenges and co-develop strategies for integrating sustainable and circular practices. It served as a platform for textile industry stakeholders to share ideas, technologies, and best practices aimed at driving innovation and long-term transformation across the sector.

Symposium on Technology Transfer, Commercialization & Innovations for MSMEs in the Era of Sustainability and AI


The DST-Amrita Technology Enabling Centre (TEC), in collaboration with the Amrita School of Business, Amritapuri, and the Centre for Management Development (CMD), Trivandrum, successfully organized a symposium on "Technology Transfer, Commercialization & Innovations for MSMEs in the Era of Sustainability and AI." The event convened key stakeholders from academia, industry, and government to explore how MSMEs can leverage technology for sustainable growth. Distinguished speakers emphasized AI integration for intelligent decision-making, cost efficiency, and market expansion. Government officials highlighted the importance of climate resilience technologies, disaster management solutions, and microclimate monitoring. Panel discussions focused on simplifying intellectual property (IP) transfer, strengthening industry-academia partnerships, and utilizing government support programs such as the MSME Cluster Development Program. Experts from the defense and coir sectors presented industry challenges and potential MSME contributions. The event fostered meaningful collaboration and knowledge exchange, reinforcing DST-Amrita TEC's role in facilitating technology adoption and commercialization for MSMEs. The symposium concluded with a strong commitment to furthering innovation-driven MSME growth through strategic partnerships and capacity-building initiatives.

Patents & Designs Granted through TEC

System and a Method Thereof for Automatic Detection of Epileptogenic Focus in Pharmacoresistant Epilepsy
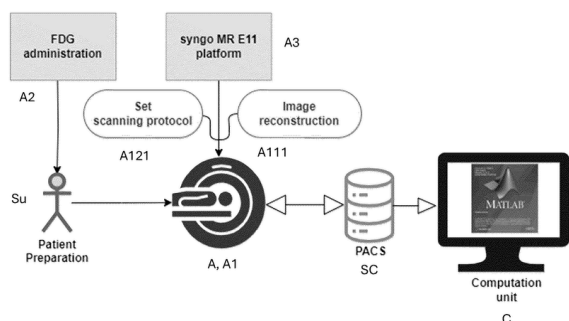

Overview of the system (PASCOM) of the invention.

The present invention introduces a system (S) and method for automatic detection of epileptogenic focus (EF) in pharmacoresistant epilepsy using an asymmetry index in FDG-PET images. The system (S) comprises an acquisition unit for capturing FDG-PET scans and simultaneous whole-brain MRI images, a storage and communication unit for managing the acquired data, and a computation unit for processing and generating asymmetry index (AI) images. The method of the present invention comprises of a novel technique, PET asymmetry after anatomical symmetrization coregistered to MRI (PASCOM), to the AI images and is independent of healthy control PET data, facilitating implementation and multicenter translation. The method is effective in localizing the epileptogenic zone, especially in MRI-negative patient (Su), and can detect epileptogenic focus (EF) independently.

Eye Sign Language Communication System
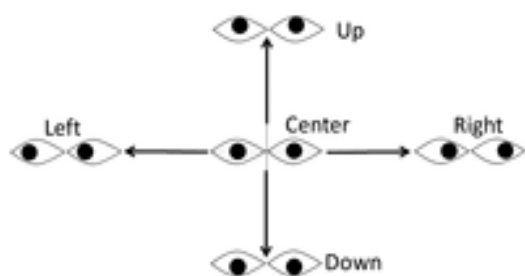
An Eye Sign language communication system and method is useful for people suffering from Quadriplegia, stroke or paralysis. The Eye Sign language communication system is based on advanced machine learning and deep learning to identify the eye sign language based on the eye blinks and direction of eye gaze with help of pupil for interpretation of signs into alphabets and words and conversion of words into speech. Hardware with sensors, controllers, and speakers along with a display screen are used to process the eye signs and display the

alphabets, words and sentences and announce the detected alphabets, words and sounds using the speakers.

Electrospun Microfibrous Porous Stretchable Membranes and the method of preparation thereof
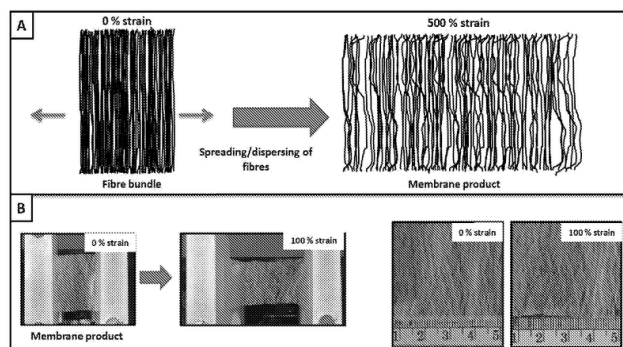
The present invention discloses a highly stretchable matrix, comprising a mesh of lattice structures of microfibrillar filaments, having a pore size enlargeable up to 8 times by moving the microfibrillar filaments perpendicular to their longitudinal axis without losing integrity. The invention also pertains to a method of preparing said highly stretchable matrix, including:

1. Electrostatic spinning of the polymeric solution into microfibers.
2. Creating an air-flow at the inter-phase of the microfibers to completely eliminate the solvent from their surface, avoiding inter-fibrillar bonding after collection.
3. Dispersing the microfibers perpendicularly to their longitudinal axis, 6-12 times the original width using a dispersion unit to obtain a stretch-responsive fibrillar matrix.