2024「中技社科技獎學金」
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Advancements in Versatile Polyvinyl Alcohol-Based Films and Hydrogels for Sensing, Carbon Capture, and Protective Coatings

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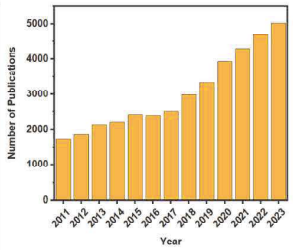
Abstract

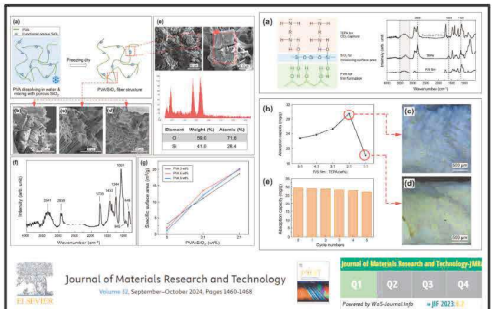
Polyvinyl Alcohol (PVA) have emerged as versatile materials with significant potential across various applications, as evidenced by the notable rise in publications in recent years. This adaptability is due to PVA's excellent film-forming abilities, mechanical strength, biodegradability, and non-toxicity. In sensing applications, the tunable properties of PVA hydrogels, combined with responsive materials, make them ideal for flexible, wearable sensors capable of detecting environmental and physiological changes. In CO_2 capture, modified PVA structures offer promising adsorption capabilities, owing to their tunable porosity and interaction with functional additives, contributing to efficient carbon capture technologies. As protective coatings, PVA's inherent hydrophilicity, when combined with specific functional groups or additives, enables the formation of robust, anti-corrosive layers on surfaces. Advances in blending, crosslinking, and surface modifications are key to tailoring PVA-based materials for these applications, enhancing properties such as mechanical resilience, gas permeability, and environmental resistance.



Number of publications related to Polyvinyl Alcohol (PVA) from 2011 to 2023 (source : manually extracted from scopus.com)

Results

Adsorbent



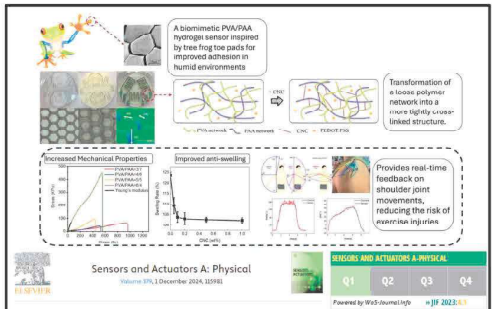
Journal of Materials Research and Technology

Synthesis and characterization of porous silica and composite films for enhanced CO_2 adsorption: A circular economy approach

Tzu-Teng Huang[a], Dieter Rahmadiawan[a,b], Shih-Chen Shi[a,#], Shou-Ting Cheng[a], Dieter Rahmadiawan[a,b]

Full Paper

Sensor



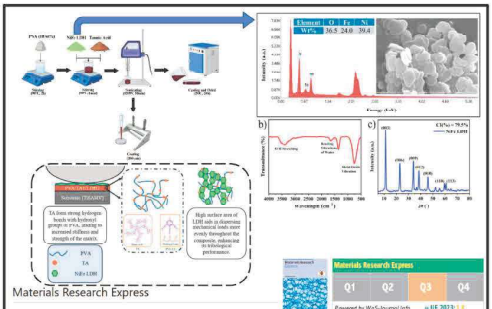
Sensors and Actuators A: Physical

Developing biomimetic PVA/PAA hydrogels with cellulose nanocrystals inspired by tree frog structures for superior wearable sensor functionality

Shih-Chen Shi[a,#], Shou-Ting Cheng[a], Dieter Rahmadiawan[a,b]

Full Paper

Coating



Materials Research Express

ACCEPTED MANUSCRIPT • OPEN ACCESS

Reinforcing polyvinyl alcohol films with layered double hydroxide and tannic acid to enhance tensile strength, tribological performance, and corrosion resistance in biomedical coating applications

Dieter Rahmadiawan[1], Shih-Chen Shi[2] and Wei-Ting Zhuang[2]

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Full Paper

Research Experiences

List of SCI publications ac NCKU PhD Student

- **Rahmadiawan, D.**, Shi, S., & Zhuang, W.-T. (2024). Reinforcing polyvinyl alcohol films with layered double hydroxide and tannic acid to enhance tensile strength, tribological performance, and corrosion resistance in biomedical coating applications. Materials Research Express.
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- **Rahmadiawan, D.**, Shi, S.-C., Abral, H., Ilham, M. K., Sugiarti, E., Muslimin, A. N., Ilyas, R. A., Lapisa, R., & Putra, N. S. D. (2024). Comparative Analysis of the Influence of Different Preparation Methods on the Properties of TEMPO-Oxidized Bacterial Cellulose Powder Films. Journal of Natural Fibers, 21(1), 2301386.
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- **Rahmadiawan, D.**, Shi, S. C., Fuadi, Z., Abral, H., Putra, N., Irwansyah, R., Gasni, D., & Fathoni, A. M. (2023). Experimental investigation on stability, tribological, viscosity, and thermal conductivity of MXene/Carboxymethyl cellulose (CMC) water-based nanofluid lubricant. Jurnal Tribologi, 39(MYTRIBOS 2023 (Part 1)), 36–50.
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Awards and Recognition

1. **NSTC International Travel Grant** by the National Science and Technology Council, Taiwan (2024) – Awarded to attend The 50th International Conference on Metallurgical Coatings and Thin Films (ICMCTF 2024) in San Diego, USA.
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3. **Best Paper Award** by the Malaysian Tribology Society (MYTRIBOS), Malaysia (2023) – Awarded during the MYTRIBOS Symposium 2023 held at Universiti Putra Malaysia (UPM).

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