Scientists pioneer sustainable carbon capture from shrimp waste

Scientists develop a groundbreaking waste-to-carbon technology for efficient CO□ capture from shrimp shells, heads, and intestinal tracts.

SHARJAH, EMIRATE OF SHARJAH, UNITED ARAB EMIRATES, August 25, 2025 /EINPresswire.com/ -- by University of Sharjah

Researchers at the University of Sharjah have developed an innovative method to transform shrimp waste—typically discarded in large quantities by the seafood industry—into a valuable carbon product capable of capturing carbon dioxide (CO□).

This breakthrough offers a sustainable solution to both waste management and climate change mitigation.
Led by Dr. Haif Al-Jomard, the team has introduced a novel waste-to-carbon technology that utilizes shrimp shells, heads, and intestinal tracts to produce activated carbon.

This material demonstrates excellent CO□ adsorption capabilities, positioning it as a promising candidate for industrial carbon capture applications, adds Dr. Al-Jomard.

White shrimp waste, sourced from Souq Al Jubail in Sharjah, UAE, originated from shrimp harvested in Oman. The material was thoroughly washed with deionized water, air-dried at 65□°C overnight, then crushed, ground, and sieved into a fine powder. Credit:

“Our study turns shrimp waste into a high-performance carbon product. This not only addresses the environmental challenges posed by seafood waste but also contributes to global efforts to reduce greenhouse gas emissions and climate change mitigation”.

Published in the journal Nanoscale, the research outlines a process involving pyrolysis of shrimp waste to produce biochar, followed by acid treatment, chemical activation and ball milling. The resulting activated carbon exhibits strong CO□ capture performance and long-term stability

across multiple adsorption–desorption cycles. (Original Source URL: https://pubs.rsc.org/en/content/articlelanding/2025/nr/d5nr00725a/unauth)

Shrimp, lobster, and crab shells processing generates up to eight million tons of waste annually, much of which is discarded. The study utilized white shrimp waste—specifically shells and heads—sourced from Souq Al Jubail in Sharjah, in the United Arab Emirates, with the shrimp originally harvested in Oman. The waste was meticulously cleaned and air-dried before processing.

Professor Chaouki Ghenai, co-author and expert in Sustainable and Renewable Energy at the University of Sharjah, emphasized the economic and environmental benefits of the method. "This approach offers a cost-effective route to producing activated carbon, turning a problematic waste stream into high performance, efficient, and environmentally friendly product with wide-ranging applications."

Activated carbon derived from shrimp waste has potential uses beyond carbon capture, including air and water purification, solvent recovery, gold extraction, and even medical applications. In the context of carbon capture, utilization, and storage (CCUS), the material could be adopted by industries such as power generation, cement, steel manufacturing and petrochemicals.

White shrimps before processing. They were collected from Souq Al Jubail in Sharjah, UAE. The shrimps were harvested in Oman. By-products were later used as feedstock for activated carbon. Credit: Haif Al-Jomard / University of Sharjah

General shrimp waste, collected from Souq Al Jubail in Sharjah, UAE. The shrimp originated from Oman. Credit: Haif Al-Jomard / University of Sharjah

The researchers highlight that their method aligns with the principles of the circular economy, resource efficiency, and waste valorization, eliminating waste and pollution by reducing overall

resource consumption and converting by-products into valuable and highly efficient resources.

“Our findings validate a scalable and sustainable strategy for shrimp waste valorization,” they write. “The combined thermal, chemical and mechanical treatments of shrimp waste enhance both the textural and chemical properties of the final activated carbon material, making it a viable solution for climate change mitigation.”

This pioneering work not only showcases the potential of shrimp waste as a resource but also sets a foundation for future innovations in sustainable carbon capture technologies.

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