

**TECH OFFER**

## Low-Cost Adsorbents From Spent Coffee Grounds For Industrial Wastewater Treatment



### KEY INFORMATION

**TECHNOLOGY CATEGORY:**

**Waste Management & Recycling - Food & Agriculture**  
Waste Management  
**Waste Management & Recycling - Industrial Waste**  
Management  
**Chemicals - Organic**  
**Environment, Clean Air & Water - Filter Membrane &**  
Absorption Material  
**Sustainability - Circular Economy**

**TECHNOLOGY READINESS LEVEL (TRL):** **TRL4**

**COUNTRY:** **SINGAPORE**

**ID NUMBER:** **TO174131**

### OVERVIEW

Spent coffee grounds are one of the major food waste produced globally with several million tonnes being discarded annually. It has been reported that only 6% of the original coffee cherry can be used to make a cup of coffee and the remaining balance are inedible and has no value to the industry. As such, a large amount of residue is currently generated from the coffee industry and disposed of at incineration plants or landfills.

This technology features a cost-effective and scalable thermochemical process to transform spent coffee grounds into carbon-

rich solid materials, known as hydrochar, as a form of low-cost solid adsorbents for industrial wastewater treatment. Thermochemical processes are well suited for wet biomass such as spent coffee grounds and utilises mild temperature profiles under relatively low pressures. The process also has the potential to convert other kinds of food waste, such as durian husks, coconut husks, fruit peels etc, into hydrochar. This presents a sustainable solution for creating a circular economy and minimising negative impact on the environment by converting non-edible and no value food waste into a value-added product for food and water industries.

## TECHNOLOGY FEATURES & SPECIFICATIONS

The technology relates to an innovative and custom-designed thermochemical reactor capable of converting the spent coffee grounds into solid adsorbents also known as hydrochar. Hydrochar particles produced have the following attributes which include a robust mesoporous framework, higher surface area, and functionalised removal of cations, anions and organic pollutants in wastewater. Up to 80% of the organics and chemical oxygen demand can be removed after passing through the hydrochar. After water treatment usage, hydrochar can be repurposed as a soil conditioner which helps in plant germination, closing the loop on food waste.

The thermochemical reactor is also capable of converting other food wastes including durian husks, coconut husks, fruit peels, and other non-edible food waste.

## POTENTIAL APPLICATIONS

The technology can be adopted in the food and beverage industry that are looking to upcycle the non-edible and no value food waste into value-added products, such as solid adsorbents. The carbon-rich material, hydrochar, presents a sustainable alternative as the low-cost adsorbent that can attract interest from sectors that require treatment of reject and backwash water. These include industries from semiconductors, petrochemicals, wastewater treatment, desalination, and textiles.

## UNIQUE VALUE PROPOSITION

- Offers a cost-effective process to produce higher value-added products from food waste, creating a circular economy
- Reduced disposal cost
- Revenue creation from waste
- Tailor-made design of thermochemical reactor to produce higher surface area and better efficiency of solid adsorbents from food waste
- Highly scalable