ABSTRAK

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Tahun : 2025

Judul : Pengembangan Material Karbon Dot untuk Aplikasi Evaporator Air Tenaga Surya

Krisis air bersih mendorong pengembangan teknologi pemurnian berbasis energi terbarukan. Salah satu solusinya adalah evaporator surya dengan material fototermal. Penelitian ini mengembangkan komposit karbon dot–ampas tebu dengan tambahan kurkumin untuk meningkatkan laju evaporasi.

Karbon dot disintesis menggunakan metode microwave dari asam sitrat, urea, dan variasi kurkumin (0,01; 0,05; 0,1 g). Karakterisasi UV-Vis menunjukkan peningkatan absorbansi seiring kenaikan konsentrasi kurkumin. Spektrum PL menunjukkan emisi tertinggi pada variasi 0,1 g. FTIR mengonfirmasi adanya gugus –OH, C=O, dan C–O yang mendukung sifat fototermal.

Komposit diuji menggunakan solar simulator (1 kW/m²). Laju evaporasi tertinggi sebesar 2,6 $kg \cdot m^{-2} \cdot h^{-1}$ diperoleh pada variasi 0,1 g, setara 65% dari batas optimal sistem fototermal (~4,0 $kg \cdot m^{-2} \cdot h^{-1}$). Penambahan kurkumin terbukti meningkatkan efisiensi komposit dalam aplikasi evaporator air tenaga surya.

Kata kunci: Air Bersih, Karbon Dot, Kurkumin, Ampas Tebu, Evaporator Surya, Material Fototermal.

ABSTRACT

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Tittle : *Development of Carbon Dot Material for Solar Water Evaporator Application*

The clean water crisis has driven the development of purification technologies based on renewable energy. One promising solution is solar evaporators utilizing photothermal materials. This study focuses on developing a carbon dot–bagasse composite with added curcumin to enhance evaporation rates.

Carbon dots were synthesized via a microwave method using citric acid, urea, and varying amounts of curcumin (0.01; 0.05; 0.1 g). UV-Vis characterization showed increased absorbance with higher curcumin concentrations. PL spectra exhibited the highest emission at 0.1 g variation. FTIR confirmed the presence of –OH, C=O, and C–O functional groups, contributing to photothermal and hydrophilic properties.

The composite was tested under a solar simulator (1 kW/m²). The highest evaporation rate of 2.6 kg·m⁻²·h⁻¹ was achieved with 0.1 g curcumin, equivalent to 65% of the optimal rate reported for photothermal systems (~4.0 kg·m⁻²·h⁻¹). The results demonstrate that curcumin addition effectively enhances the photothermal efficiency of the composite for solar water evaporation applications.

Keywords: *Clean Water, Carbon Dots, Curcumin, Sugarcane Bagasse, Solar Evaporator, Photothermal Material.*