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AgriCerPSi - Synthesis of Agricultural Waste-Derived Ceramic Porous Silicate Particle

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Rice husk is one of the most abundant agricultural by-products in the Philippines, comprising about 20% of harvested rice by weight. Its disposal through open burning produces rice husk ash (RHA), which poses environmental risks such as air pollution, soil alkalinity alteration, and uncontrolled ash accumulation. At the same time, RHA is a rich source of silica, containing up to 80–98 wt.% SiO_2, making it a promising raw material for value-added applications. This study aims to valorize RHA by synthesizing porous silicate particles (SPPs) through a simple process. Silica (SiO_2) was extracted from calcined RHA (700 ℃) via acid treatment and subsequently synthesized into sodium silicate using NaOH solution of varying concentrations. The sodium silicate served as the precursor for SPP synthesis via the emulsion method. Sodium silicate was characterized by XRF and FTIR, while the synthesized SPPs were analyzed using N_2 adsorption–desorption (BET–BJH) to evaluate porosity. Results revealed that RHA-derived SPPs exhibit mixed micro–mesoporous silicate structures. The result of this study demonstrates that RHA can be effectively repurposed into high-quality SPPs, addressing waste management concerns while providing a sustainable silica source for advanced material applications.

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