SUSTAINWARE: A Sustainable Alternative for Stoneware Production

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This study proposes the development of eco-friendly stoneware using waste glass and rice husk ash (RHA). The global recycling rate for glass is low, at approximately 20%, while RHA is a significant byproduct of biomass power plants worldwide that utilize rice husk as fuel. Both waste materials have the potential for reuse in the ceramic industry, a sector where sustainability is essential due to its high consumption of energy and mineral resources, as well as the environmental impact caused by raw material extraction. To assess the feasibility of combining these waste materials, nine stoneware formulations were developed. The RHA, sourced from a thermoelectric plant, was only sieved, while the glass, obtained from household waste, was ground. Test specimens containing these waste materials were compared to reference, made with the conventional composition of stoneware, composed of kaolin, feldspar, and quartz. The analyses considered firing temperature, mechanical strength, linear shrinkage, density, water absorption, leaching and thermal shock. The sustainability of the proposal was measured using Life Cycle Assessment (LCA) with the openLCA software. The best formulation demonstrated the feasibility of incorporating up to 60% waste (30% CCA and 30% glass), with results confirming properties equivalent to conventional ceramics and the material's inertness. Additionally, the LCA indicated a reduction in environmental impact, with lower consumption of natural resources (water and soil), reduced energy demand, and lower carbon emissions throughout the production process.

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