

“Recycling of Hazardous Solid Waste Material Using High-Temperature Solar Process Heat. 2. Reactor Design and Experimentation”

Ann Knolhoff
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Electric Arc Furnace Dust (EAFD) is a byproduct of the metallurgical industry, which is composed of primarily lead, zinc, and iron oxides. Currently, the methodology for disposing of this toxic waste requires an enormous amount of heat, energy, and maintenance. It also releases greenhouse gases, excess carbon dioxide, and other pollutants into the atmosphere. There is a growing need for the development of a disposal method of this hazardous waste in an environmentally safe manner, while using less energy. The current research focuses on the development, implementation, and experimentation of a solar chemical reactor designed for the carbothermic reduction of EAFD. A 10-kW reactor is developed with two cavities in series, which can handle thermochemical processes at elevated temperatures. Experimentation of the device is performed with the use of two different modes of operation: continuous and batch. Both methodologies result in an extraction of over 90% of the toxic compounds in EAFD.

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