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Molten Salt Oxidation – A Safe Process for Hazardous Organic Wastes Decomposition

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Abstract

In the last decades, there were significant changes in the perception of the necessity of environmental preservation. The main actions that have been used to impede the migration of pollutants to the environment are: the inventory of the hazardous chemical compounds, their safety collection and their suitable treatment. One of the predominant concepts currently is that the wastes should be destroyed in some point of their cycle of use, specially the dangerous ones, in reason of the risk that they represent for human beings, animals and plants. The worldwide interest in the development of advanced decomposition technologies of wastes elapses, mainly, of the problems created by the denominated POPs - persistent organic pollutants. The thermal decomposition has been commercially used in the disposal of hazardous wastes, mainly the incineration, whose most important characteristic is the combustion with flame. However, the incineration technologies have failed to meet some performance criteria. An alternative to the incineration, for the treatment of a vast range of dangerous wastes or not, it is the thermal decomposition by means of the submerged oxidation in molten salt baths. The interest in the decomposition of hazardous wastes by advanced methods, as alternative to the incineration, and especially through the molten salt oxidation has elapsed mainly by the adoption of more restrictive air emissions legislations in several countries. Among several advantages, such as oxidative reactions that transform completely the components of the organic solvent in just CO₂ and water, the process equipment can be built in small scale. Molten salt oxidation equipment has already been built at IPEN and different organic wastes have been tested. During the program the selection and the performance tests of the employed materials, the construction of components and auxiliary systems, their assembly and the operational tests have been carried out. Several decomposition tests of different organic wastes have been performed in laboratory equipment developed at IPEN, with excellent results (dichlorethane, dichlorodifluoromethane and toluene). The completeness of the oxidation reactions in the range of temperatures studied (900 to 1020°C) was evaluated by mass spectrometry of the gases released. This paper describes the main characteristics of the molten salt process, besides the conception, the construction, the development of equipment with this purpose in IPEN and its effectiveness. During the activities the main accomplished tasks were the selection and the performance tests of the employed materials, the construction of components and auxiliary systems, their assembly and the operational tests carried out.

Keywords: *oxidation, molten, salts, hazardous, wastes.*
