

The immobilisation of flue gas treatment residues through the use of a single staged wash and crystalline matrix encapsulation (CME) treatment process

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Abstract

All incineration and other thermal treatment technologies produce flue gas treatment residues (FGTR) that require specialised treatment and disposal. In the United Kingdom the FGTR arising from municipal solid waste incineration is classified as a hazardous (special) waste. This is primarily due to the irritant properties of chloride, but also due to the content of heavy metals. These wastes must be handled, transported & disposed of in accordance with the Special Waste Regulations 1996 and are disposed into highly engineered landfill sites, which isolate the material from the environment. The low levels of trace elements in the FGTR mean that the recycling of the metallic elements is not economic. Control through stabilisation and encapsulation in a crystalline matrix converts the FGTR primary form from a powder into solid block form. The use of a novel metal matrix encapsulation (MME) process allows low level engineering processes to be employed, increasing a range of reuse options combined with long-term improved storage.

Introduction

All incineration and other thermal treatment technologies produce a residual ash and smaller amounts of flue gas treatment residues (FGTR) that require specialised treatment and disposal. These residues, either treated or untreated, have presented the incinerator operators with both problems and opportunities (1) (2). For example, the use of the residual ash from municipal solid waste (MSW) incinerators as an aggregate substitute is widespread across the European Union (EU). In some EU states, but not in the United Kingdom (UK), this form of recovery is included in national recycling statistics (3).

There are many options available for treating MSW incineration flue gas and the different processes result in FGTR of varying physical, chemical and handling characteristics (4). Generally, the selection of the process depends on the emission standards to be achieved, the cost and local pollution control and waste management regulation. However, most UK incinerators have adopted dry or semi-dry acid gas scrubbing followed by the use of bag filters.

In the UK the FGTR from municipal solid waste incinerators (MSWI) is classed as a hazardous (special) waste and as such must be handled, transported and disposed of in accordance with the UK's Special Waste Regulations. Currently, these residues are deposited in hazardous waste landfill sites. These sites are highly engineered and designed to provide long-term isolation of the material from the environment.

A number of alternative FGTR treatment processes have been developed and these include sintering, vitrification and encapsulation of the material into a concrete mass (5).

All the above processes present environmental or financial problems. This paper discusses a novel process of crystalline matrix encapsulation (CME), based upon a metal matrix. This process involves the utilisation of the large surface area of powdered iron to form a metal matrix encapsulation (MME) process. This forms a strong solid block form for either re-use or final disposal and discussed in the text below.