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Developments in the characterisation of waste materials for environmental impact assessment purposes

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Abstract

The characterisation of waste is entering a new phase with the latest developments of characterisation leaching tests and associated modelling capabilities. The currently applied too simple testing approaches lead to poor choices in waste management. With the increased insight in release controlling processes chemical speciation aspects can be addressed even in the most complex and heterogeneous waste materials. From a composition perspective materials may be highly variable, but often materials are far more consistent in their leaching behaviour. This aspect should be exploited more extensively as it holds the key to treat waste materials in such a way that long term solutions are achieved rather than reaching temporary gains.

Keywords: Waste; Leaching; Scenarios; Environmental impact; Modelling; Disposal; Reuse

1. Introduction

There are several questions to be answered by waste characterisation. Any material can become a waste, which implies that the range of materials encountered in evaluating waste is wider than in any other field. Typical questions in waste management relate to the issue how a material must be classified (inert, non-hazardous, hazardous waste) or whether the material has potential for (partial) recovery and subsequent recycling or beneficial use. Specific waste materials exhibit systematic leaching behaviour, which is not obvious from a single step test result, but surely emerges from more detailed characterisation tests. Testing is often carried out at relatively high liquid to solid ratio (L/S), this does not give insight in behaviour under often low L/S conditions encountered in the field (first fractions of a column test). World wide there are too many leaching tests addressing the same basic question: how much does this material leach under practical circumstances? A further question is whether a new approach for landfilling of waste is needed that allows identification of wastes that form a mix which has acceptable long term release behaviour and thus focus on segregation of waste to meet such minimum long term release demands. For a proper understanding of leaching behaviour, information on the behaviour of major constituents is crucial as they dictate the leaching environment for trace contaminants. In addition, the emphasis has been too much on heavy metals (e.g. Pb, Cu, Cd, Zn, Hg) and too little on oxyanions (e.g. Se, Sb, Mo, V, W), which are rather mobile under neutral pH conditions.

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2. Basis for judgement

Standardisation of leaching methods is the key to the generation of comparable data among interested parties (regulator–industry–research). As the question to be answered about the possible environmental impact from various materials is very much the same, this calls for horizontal standardisation (development of standards for a wider range of materials to the extent possible) and harmonisation (standards applicable in different jurisdictions/countries) of leaching test methods (Van der Sloot et al., 1997; Van der Sloot and Dijkstra, 2004).

In CEN/TC 292 (characterisation of waste) and ISO/TC 190 (Soil) test methods are in development for characterisation of the leaching behaviour of granular and monolithic materials, which prove to be applicable for a broad range of materials outside the field of waste. For granular materials, characterisation consists of a pH dependence leaching test and a percolation test. For monolithic materials, a pH dependent leaching test and a dynamic monolith leach test (type of tank test) are suitable (Van der Sloot and Dijkstra, 2004). The pH dependent leaching test provides the necessary insight in the chemical speciation aspects, whereas the percolation test and the dynamic monolith leach test provide the time dependent release characteristics. By placing single step test results in perspective by presenting them in relation to characterisation leaching tests results, the single step test data all of a sudden become far more meaningful.

3. Approach

The main question to be answered is not providing a test result, but how the test result(s) can be used to answer the question. This implies an evaluation that requires more than just the leaching test. An inte-

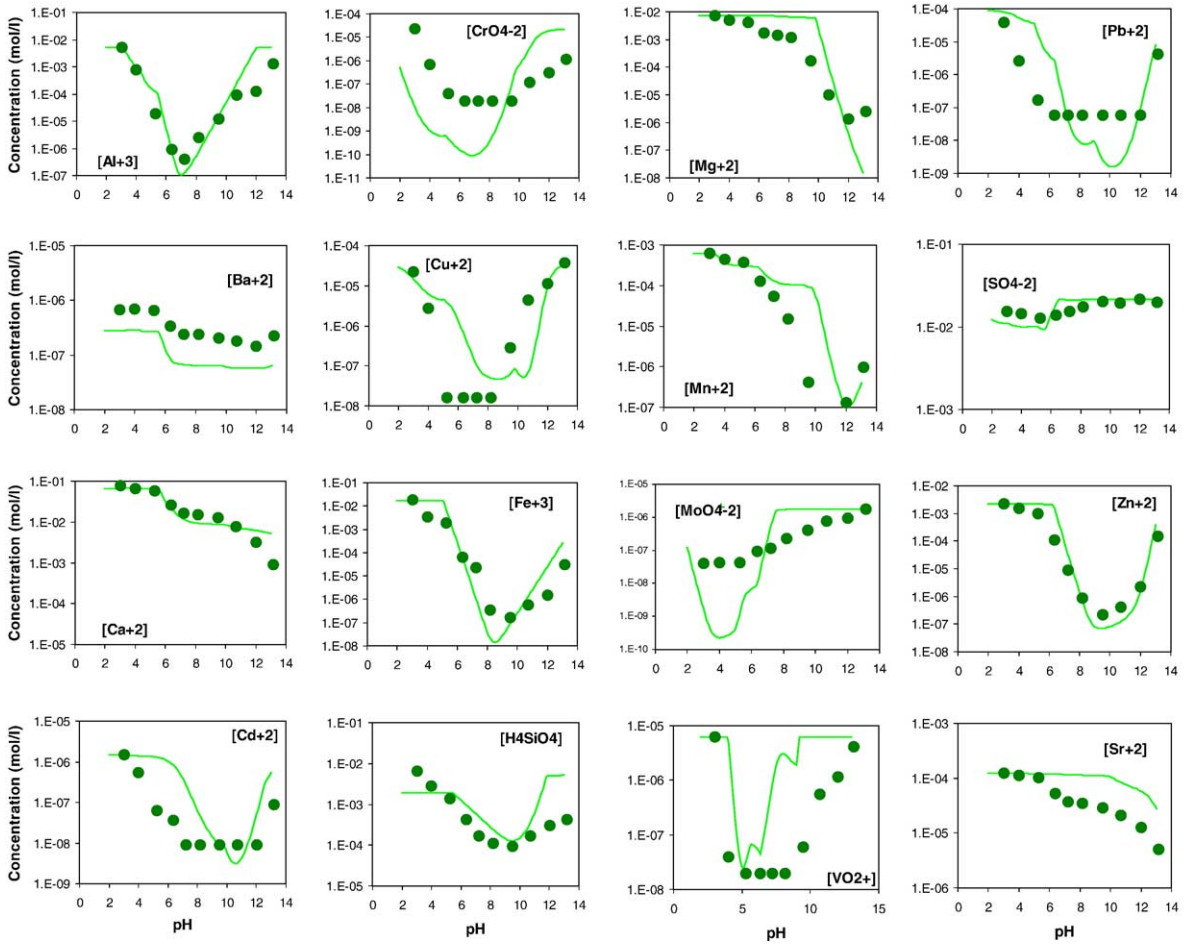

Fig. 1. Modelling results for a landfilled waste mix consisting of predominantly inorganic waste tested in comparison with pH dependence leaching test (PrTS 14429) data using one set of conditions for all major, minor and trace constituents.