INFLUENCE OF THE FORM IN WHICH A CERAMIC COMPOSITION IS PRESENTED ON ITS DUSTINESS

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1. INTRODUCTION

Recent studies on emissions of particulate matter (PM) in industrial processes in which materials of a particulate nature are handled indicate that diffuse emissions can contribute significantly to overall PM emissions into the atmosphere. In this sense, the most recent legislation on industrial emissions establishes the application of Best Available Techniques (BATs) for the minimisation of the environmental impact associated with this type of emissions.

On the other hand, the legislation on occupational health highlights the need to limit the inherent risks of exposure to PM, mainly by inhalation, of workers in occupational environments.

Both in selecting BATs for minimising diffuse dust emissions and in establishing techniques for controlling exposure to PM in workplace atmospheres, it is essential to have information on raw materials dustiness (proneness of the materials to produce dust on handling).

The main objective of this study was to evaluate the optimum conditions, with regard to the generation of diffuse dust emissions, for handling compositions of raw materials used in the manufacturing ceramic tile bodies.

2. MATERIALS AND METHODOLOGY

The sample studied was a typical raw materials composition used in manufacturing earthenware wall tile bodies. In this sense, it may be noted that dustiness is not an intrinsic characteristic of a material, but rather one that depends on several factors, such as the type of handling and the characteristics of the material being processed. Consequently, representative samples of the different raw materials preparation and conditioning process stages were selected. These included mixing and homogenising the raw materials, crushing, milling and wetting–granulation (dry preparation) or spray drying (wet preparation).

The samples were then characterised. Characterisation included the determination of dustiness and of those parameters that could significantly influence dustiness.

- Dustiness: The tests were conducted using one of the methods put forward in standard UNE EN 15051:2013 [1], namely the continuous drop method. The tests yielded the mass fractions of inhalable dust (w_I) and of respirable dust (w_R) [2].
- Particle size distribution (PSD): This was determined using a battery of sieves (125 μm, 300 μm, 500 μm, 2 mm, 4 mm, and 10 mm).
- Moisture content: This was determined by the oven-drying method.
- Flowability: Flowability was evaluated by determining the Hausner ratio. This is defined as the quotient of the bulk density of the packed particle bed (by vibration or tapping) and the aerated bulk density of the particle bed that is obtained by pouring powder into a container without stirring or vibration.

3. EXPERIMENTAL RESULTS

The comparative analysis of the dustiness of the different samples of the composition being studied, including the dustiness classification limits, is shown in Figure 1.

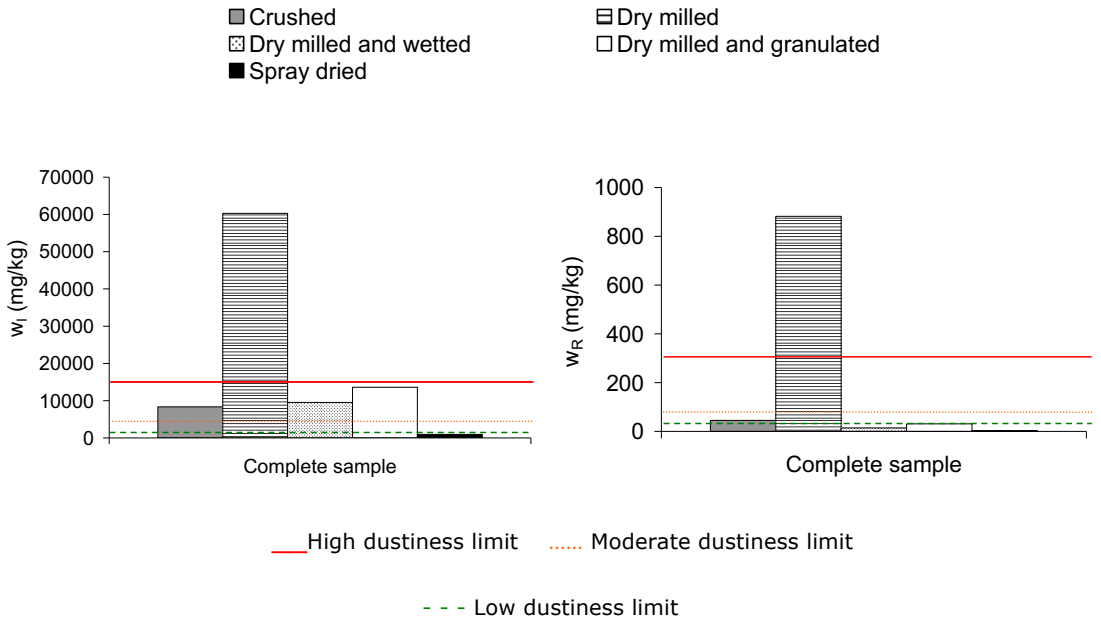

Figure 1. *Comparative analysis of the dustiness of the same composition subjected to different treatments.*

4. CONCLUSIONS

- The procedure used allowed the dustiness of the different (granulated and non-granulated) compositions to be quantified and enabled them to be classified as a function of the criteria set out in the above standard.
- The wetted composition and the agglomerated (granulated and spray-dried) compositions exhibited much lower dustiness than that of the milled composition. Consequently, wetting and agglomeration could be deemed effective measures for reducing diffuse dust emissions. In particular, with regard to the studied compositions, the spray-dried composition seemed to constitute the most favourable form of presentation from a diffuse emissions generation standpoint.

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[2] European Committee for Standardization (CEN): Workplace atmospheres. Size fraction definitions for measurement of airborne particles (EN 481). [Standard] Brussels, Belgium: CEN, 1992.