

## **Reduction of PM industrial ceramic emissions reflected on key components concentrations of ambient PM<sub>10</sub>**

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The relationship between the reduction of specific ceramic particulate emissions and ambient levels of some PM<sub>10</sub> components, such as Zn, As, Pb, Cs and Tl, was evaluated. To this end, the industrial area of Castellón (Eastern Spain) was selected, where around 40% of the EU glazed ceramic tiles and a high proportion of EU ceramic frits (middle product for the manufacture of ceramic glaze) are produced.

The PM<sub>10</sub> emissions from the ceramic processes (tile and frit manufacture) were calculated over the period 2000 to 2007 taking into account the evolution of the degree of implementation of corrective measures throughout the study period. Whereas the emissions from tile manufacture didn't undergo significant changes during the study period, the emissions from frit manufacture showed a marked decrease. This decrease is mainly due to the implementation of abatement systems (mainly bag filters) in the majority of the fusion kilns for frit manufacture in the area as a result of the application of the Directive 1996/61/CE, IPPC.

On the other hand, ambient PM<sub>10</sub> sampling was carried out from April 2002 to July 2008 at three urban sites and one suburban site of the area and a complete chemical analysis was made for about 35 % of the collected samples, by means of different techniques (ICP-AES, ICP-MS, Ion Chromatography, selective electrode and elemental analyser). The series of chemical composition of PM<sub>10</sub> allowed us to apply a source contribution model (Principal Component Analysis), followed by a multilinear regression analysis, so that PM<sub>10</sub> sources were identified: mineral, soil, industrial #1, industrial #2, road traffic, regional background and sea spray. The contribution of these sources to bulk ambient PM<sub>10</sub> was quantified on a daily basis, as well as the contribution to bulk ambient concentrations of the identified key components (Zn, As, Pb, Cs, Tl). The contribution of the sources identified as the manufacture and use of ceramic glaze components (industrial #1 and industrial #2), including the manufacture of ceramic frits, accounted for more than 65, 75, 58, 53, and 53% of ambient Zn, As, Pb, Cs and Tl levels, respectively (with the exception of Tl contribution at one of the sites). The

important emission reductions of these sources during the study period had an impact on ambient key components levels, such that these were reduced significantly during the study period. A simple statistical analysis showed that there was a high correlation between PM<sub>10</sub> emissions from the ceramic sources and ambient key components levels ( $R^2=0.61-0.98$ ).

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