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Reduction of PM emissions from specific sources reflected on key components concentrations of ambient PM10

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The relationship between specific particulate emission control and ambient levels of some PM10 components (Zn, As, Pb, Cs, 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 PM10 emissions from the ceramic processes were calculated over the period 2000 to 2007 taking into account the degree of implementation of corrective measures throughout the study period. Abatement systems (mainly bag filters) were implemented 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, leading to a marked decrease in PM10 emissions. On the other hand, ambient PM10 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 PM10 allowed us to apply a source contribution model (Principal Component Analysis), followed by a multilinear regression analysis, so that PM10 sources were identified and their contribution to bulk ambient PM10 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, 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 there was a high correlation between PM10 emissions from these sources and ambient key components levels (R2= 0.61-0.98).