POLLUTION CHARACTERISTICS AND RESIDENTIAL INDOOR-OUTDOOR RELATIONSHIPS OF PM_{10} ELEMENT IN ONE COMMUNITY IN TIANJIN

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Background and Aims: Studies on indoor-outdoor relationship are in need to better understand and calibrate exposure measurement errors when ambient concentrations are used as real exposure for epidemiological studies. The object is to characterize the influences of outdoor contribution and indoor sources on indoor PM_{10} and metals in Tianjin.

Methods: Residential indoor, outdoor airborne particulate matter (PM_{10}) were concurrently collected for total 55 families in Tianjin in summer of 2009, using personal exposure monitors (PEM). All the filter samples were cut into two halves and analyzed for 39 elements using ICP-MS and ICP-OES. The enrichment characteristics of elements were analyzed by enrichment factor and indoor-outdoor relationship and penetration were analyzed by regression models.

Results: Total 39 determined elements made up (19.4 ±12.8)%, (22.1 ±13.8)%, (18.7 ±7.2)% of the indoor, outdoor and community-central PM_{10}, respectively, of which 8 main elements (i.e.: Si>Ca>Al>Fe>K>Na• Mg>Ti)contributed 86.3%, 88.9%, 88.9% of their total elements. Cd, Bi and Zn were three most enriched metals in all microenvironments, of which corresponding Enrichment factors in indoor environment were 1290.80, 254.39, 252.77. The penetration rates of K, V, Mn, Cu, Zn, As, Cd, Pb were 0.51, 0.40, 0.44, 0.85, 0.58, 0.67, 0.58, 0.77.

Conclusions: By comparison of background value of soil elements, 13 metals including Cr, Ni, Cu, Zn, As were extremely enriched in indoor, outdoor and community-central PM_{10}, which indicating ubiquitous anthropogenic emission sources. Regression models were constructed for each metal, which showed high indoor-outdoor correlations and penetration rates among K, V, Mn, Cu, Zn, As, Cd, Pb, with low indoor sources contributions.

References:

Matthias Stolzel, Susanne Breitner, Josef Cyrys, et al. Daily Mortality and Particulate Matter in Different Size Classes in Erfurt, Germany. Exposure Science & Environment Epidemic 2007;17:458-467.

Gregory V. Ulirsch, Louise M. Ball, Wendy Kaye, et al. Effect of Particulate Matter Air Pollution on Hospital Admissions and Medical Visits for Lung and Heart Disease in Two Southern Ldaho Cities. Exposure Science & Environment Epidemic 2007;17:478-487.

Sonia Yeh, Mitchell J. Small. Incorporating Exposure Models in Probabilistic Assessment of the Risks of Premature Mortality from Particulate Matter. Exposure Science & Environment Epidemic 2002;12:389-403.

Zhao WX, Hopke PK, Gary N, et al. Source Apportionment and Analysis on Ambient and Personal Exposure Samples with a Combined Receptor Model and an Adaptive Blank Estimation Strategy. Atmospheric Environment 2006;40:3788-3801.

Hoek G, Kos G, Harrison R, et al. Indoor-outdoor Relationships of Particle Number and Mass in Four European Cities. Atmospheric Environment 2008;42:156-16.