Bisphenol A concentrations in indoor and outdoor PM2.5 samples

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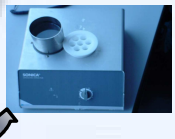
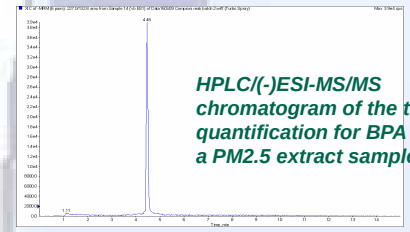
Bisphenol A [2,2-bis(4-hydroxyphenyl)propane] (BPA) is an industrial chemical, a monomer of the polycarbonate plastics and a precursor for a variety of epoxide resins. The high quantities supplied by industries and in use have produced accumulation of BPA in different environmental compartments, and atmospheric BPA is ubiquitous (Fu P. et Kawamura K., 2010)
BPA is a likely endocrine-disrupting compound (EDCs) (Matsushima et al., 2007; Matsumoto et al., 2005); The consideration of exposure to EDCs is critical in study of health effects, particularly in relation to indoor environments, which have been identified as an important source of chemical exposures. People spend a large fraction of their time indoor, and indoor sources of chemicals, coupled with limited ventilation and slow chemical degradation processes, cause increased pollutant concentrations indoor.

QUANTIFICATION OF BPA IN PM2.5 SAMPLES

PM2.5 samples are ultrasonically extracted in methanol (0.4 ml)



The extract is filtered and analysed by HPLC/(-) ESI-MS/MS



HPLC/(-)ESI-MS/MS chromatogram of the transition of quantification for BPA (133 m/z) in a PM2.5 extract sample

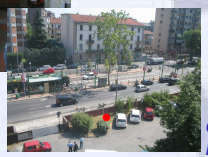
PM2.5 SAMPLING

The atmospheric occurrence of particle-bound BPA in the indoor and outdoor atmosphere at an urban site (Milan, Italy) has been investigated.
Daily (24 h) PM2.5 samples have been collected (September 2007-March 2008), and sampling took place simultaneously in the indoor and outdoor site.

Indoor: non smoking office

Low volume gravimetric sampler (38.3 l min^{-1})

24h sampled PTFE filter



Outdoor: the yard of the building where the office was set

OUTDOOR AND INDOOR CONCENTRATIONS

Daily outdoor BPA pollution levels (in PM2.5 samples) were in the range of 0.18 (± 0.05) ng m^{-3}, which are similar values compared to other cities from China, Japan, New Zeland and USA (Fu P. et Kawamura K., 2010).
We measured higher BPA concentrations in indoor than outdoor (Table 1), with an averaged indoor BPA concentration of 0.30 (± 0.04) ng m^{-3} .
Indoor atmospheric particles are on average enriched in BPA (values reported as ng μg^{-1})

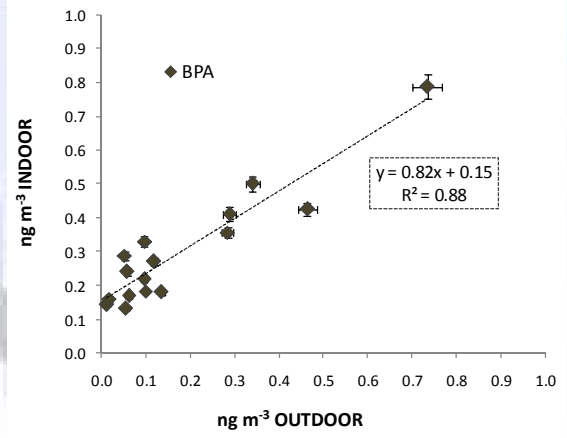


Fig. 1 Daily BPA concentration (ng m^{-3}) in PM2.5 samples indoor versus outdoor

	INDOOR			OUTDOOR			IN/OUT	
	PM2.5	BPA		PM2.5	BPA		PM2.5	BPA
	μg m^{-3}	ng m^{-3}	ng μg^{-1}	μg m^{-3}	μg m^{-3}	ng μg^{-1}	μg m^{-3} IN/OUT	ng m^{-3} IN/OUT
MEAN	16.9	0.30	18	29.0	0.18	5	0.62	3.3
SD	1.8	0.04	1	3.6	0.05	1	0.05	0.8

Tab. 1 Comparison between indoor and outdoor concentrations for PM2.5 and BPA. Mean ± SD (standard deviation)

Indoor air pollution levels are influenced by indoor pollution sources and by infiltration of outdoor air.
Daily indoor BPA concentration was correlated to daily outdoor BPA (R^2= 0.88) (Fig.1), indicating as indoor is strictly influenced by infiltration of outdoor air. The slope of the linear correlation between indoor and outdoor BPA (0.82) suggests that about 80% of outdoor BPA is transported in the indoor.
The y-intercept (0.15 ng m^{-3}) indicates that another source of indoor BPA, not related to the exchange with outdoor, occurred.

The indoor BPA concentration attributed to indoor pollution sources was estimated to be 0.14-0.18 ng m^{-3} (Tab.2). The indoor sources contributed to 19% up to 94% of the daily indoor BPA level we measured.

ESTIMATION OF THE INDOOR BPA CONCENTRATION FROM INDOOR BPA SOURCES

LINEAR RELATIONSHIP BEETWEN INDOOR AND OUTDOOR DAILY CONCENTRATIONS	the y-intercept of the linear regression	0.15 ng m^{-3}
DAYS WITH LOW OUTDOOR BPA CONCENTRATIONS (LOW IMPACT OF OUTDOOR POLLUTION ON INDOOR LEVELS)	daily outdoor BPA concentrations ordered by the lowest; mean indoor BPA concentration corresponding to the first quartile of outdoor BPA concentration (0.03 ng m^{-3})	0.18 (±0.07) ng m^{-3}
	the indoor BPA concentration corresponding to the minimum outdoor BPA concentration (0.01 ng m^{-3})	0.14 ng m^{-3}

Tab. 2 Experimental estimation of the indoor BPA source

References

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Fu P. et Kawamura K., 2010. *Ubiquity of bisphenol A in the atmosphere*. Environmental Pollution;158,:3138-3143

ACKNOWLEDGMENTS. *This work was supported by VALPM project and PROLIFE project (Municipality of Milan, Italy)*