Quantification of imidazoles in ambient aerosol particles from different environments in Europe and China

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Imidazoles are currently widely discussed in recent literature (Laskin *et al*., 2015). It was found that they potentially act as photosensitizers triggering secondary organic aerosol growth (Aregahegn et al., 2013) and that they are forming constituents of light absorbing brown carbon (e.g., Kampf et al., 2012). They have also been studied as a secondary product of the reaction of dicarbonyls with nitrogen containing compounds in a number of laboratory studies. Despite the knowledge from laboratory studies, only little quantitative information about imidazoles in ambient aerosol particles is available (Teich et al., 2016).

In the present study, 11 small alkyl-substituted imidazoles were identified and quantified in ambient aerosol samples from different environments in Europe and China. The quantified imidazoles are: 2-imidazolecarboxaldehyde, 1-butylimidazole, 2-methyl-1-propylimidazole, histidine, 1-methylimidazole, 2-methylimidazole, 4(5)-methylimidazole, 1,2-dimethylimidazole, 2,4-dimethylimidazole 1-ethylimidazole and 2-ethylimidazole.

Field measurements at five different sites in 2013 and 2014 were carried out with a PM10 DHA-80 DIGITEL sampler. The measurement sites are characterized by high anthropogenic pollution (Wangdu and Xianghe, China, summer), highly influenced by biomass burning (Leipzig, Germany, winter) and biogenic emissions (Waldstein, Germany, summer) or can be seen as a rural background site (Melpitz, Germany). Measurements in Melpitz were performed during winter and summer. Hence, a comparison between different seasons and differently influenced sites could be made. The filters were extracted into methanol. Subsequently, the solvent was evaporated until dryness under a gentle nitrogen stream. The residue was then redissolved into ultrapure water. The concentration of imidazoles was determined by using capillary electrophoresis coupled with mass spectrometry.

Maximum concentrations observed were in a range of a few ng/m^3. Imidazole rings with an additional methyl group were found to be the most abundant. The occurrence of imidazoles seems to be favored at sites with strong biomass burning influence or connected to more polluted air masses.

Our work corroborates the laboratory studies by showing that imidazoles are present in ambient aerosol samples in measurable amounts. Moreover, it further motivates to explore the potential photosensitizing properties of small alkyl-substituted imidazoles.

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