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Schwarz, Jaroslav
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A KITCHEN DEGREASER CONTAINING MONOETHANOLAMINE CAN ALTER INDOOR AEROSOL COMPOSITION FOR DAYS

Jaroslav SCHWARZ, Otakar MAKEŠ, Jakub ONDRÁČEK, Michael CUSACK, Nicholas TALBOT, Petr VODIČKA, Lucie KUBELOVÁ, Vladimír ŽDÍMAL

Institute of Chemical Process Fundamentals of the CAS, Prague, Czech Republic,
schwarz@icpf.cas.cz

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INTRODUCTION

Indoor aerosol is very important because people spend approximately 80% of their lives indoors, and it can have negative health effects (Pope, C. A. & Dockery, 2006).

The chemical transformation of particles originating outside and transported to the indoor environment is already well known and often seen in case of ammonium nitrates (Smolik et al., 2008). Nevertheless, very little is published about transformations of indoor aerosols under the effect of number of chemicals being used in our households. One group of substances being present in the domestic environment is aminium salts, used as surface active detergents. Moreover, free amines like monoethanolamine (MEA) are used in the water solution of degreasing solutes.

Using of such degreaser and consequences related to indoor aerosol are described in this study. Monoethanolamine, a part of a commercial degreaser being used in kitchens, was able to replace ammonium in its sulfate and nitrate salts in the indoor environment, while those salts usually form up to half of PM_{2.5} aerosol mass indoors.

EXPERIMENTAL SETUP

The offline sampling used quartz fiber filter downstream PM₁ and PM₁₀ sampling heads with Leckel pumps and BLPI cascade impactors loaded with greased PET foils to collect aerosol samples from both indoors and outdoors in parallel. Samples were collected for 23 h. The filters and BLPI samples were analyzed using gravimetry and ion chromatography. More details can be found in Talbot et al. (2016).

Online chemical composition was obtained by an aerosol mass spectrometer (AMS) sampling in a cycle alternating 10 min indoor and 10 min outdoor sampling using automated switching valve.

In addition to other sources, the influence of a W5 degreaser (Lidl Stiftung & Co. KG, Neckarsulm, Germany) sprayed on kitchen furniture surfaces was studied. The IC chromatography analysis showed more than 5% (w/w) of MEA in the solution.

RESULTS AND CONCLUSIONS

The results shown in Figure 1 demonstrate an abrupt change in PM₁ aerosol composition after the degreaser application. Actually, during the first day the transformation proceeded not only in aerosol but also on particles already collected on

the filter as the degreaser was used 8.5 hours after sampling started. Some influence of MEA is seen also on two consecutive days despite ventilation of the room between 9:45 and 10:00 by opening windows and cleaning the surfaces. As paper towels were used for cleaning surfaces, they were left in a basket and served probably as source for continuation of the transformation. Evaporation from other surfaces is also possible.

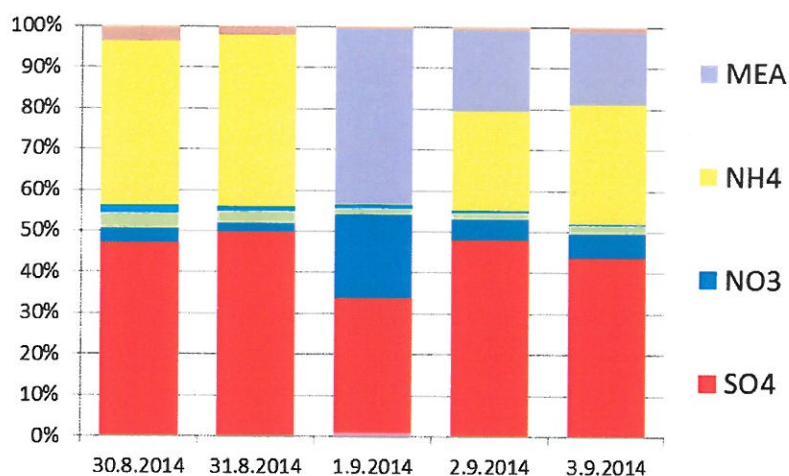


Fig. 1. Major ionic composition (in equivalent percentage) of indoor PM1 sampled before (30.-31.8.) and after (1.-3.9.) using the degreaser.

Beside this effect, the transformation of ammonium nitrate to MEA nitrate increased stability of nitrate aerosol in indoor environment and therefore exposure by nitrates increased substantially as the result of ammonium to ammonium nitrate transformation. More can be found in Schwarz et al. (2017).

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