ADOQ: Activités DDomestiques et Qualité de l'air intérieur: émissions, réactivité et produits secondaires

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Domestic activities and cleaning products use generate emissions of volatile organic compounds which can react with atmospheric oxidants coming either from outdoor or electronic equipments. More specifically, terpenes can react with ozone to form secondary pollutants such as formaldehyde whose carcinogenicity is well-known and Secondary Organic Aerosols (SOAs). Aerosols impact and health effects have been observed and confirmed for many years now by epidemiologic studies showing the influence of the aerosol size. The smaller particles can go deepest into the lungs reaching alveolar region. This is the case of SOA formed by nucleation and VOC condensation processes. SOA consequently display a very small particle diameter (< 1,0 μm). This implies the need to investigate secondary products (gases and SOA) formation pathways and chemical composition whose impact on human health is nowadays poorly known since it is still poorly characterized.

The ADOQ project aims to assess the impact of household products on the indoor air quality by characterizing pollutants emissions from household products, and estimating the secondary products formed during domestic activities. The methodology lies on the combination of real atmosphere experiments (experimental house known as MARIA: Maison Automatisée pour des Recherches Innovantes sur l’Air: automated house for innovative air research) and simulated atmospheres (cleaning products evaluation in emission chambers). The emission factors of 54 products have been determined. A dozen of products has also been tested using various scenarii chosen previously. For all the tested products an increase in VOCs concentration is observed. Good correlation between ozone and formaldehyde suggest a secondary formation of such aldehyde. Upon the use of some household product decreases of limonene and ozone mixing ratios well correlated with formation of new small particle, suggesting a secondary formation of organic aerosols. Chemical analysis of both the gaseous and particulate phase showed the presence of several functionalized compounds in both phases, suggest the importance of the two exposition pathways. Such analyses also showed products formation for which health effects are suspected, as methyl glyoxal and 4-oxopentanal, and other products for which the health effects are still unknown. The ADOQ project proposed a new methodology for the evaluation of chemical emission of household products; such data can now be part of existing databases (BUMAC, EPHETC) or be used to build a new and specific database for household products. In addition those data can be used in models for the evaluation of user’s exposure and sanitary risk.

Key words: domestic activities, household products, primary emissions, secondary emissions, reactivity, secondary organic aerosols, reaction products

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