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Characterization of mid- and long term emissions from building materials: impact of use and wear conditions

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SUMMARY

Indoor emissions from building products are conventionally characterized on new products. But ageing of building products in use in real buildings can change their surface properties and their emissions into indoor air. The aim of this research project was to characterize the impact of wear conditions and use of building products on their middle and long-term indoor emissions. For specific scenarios, in particular those involving oxidation and high relative humidity exposure, significant modifications of VOCs emissions were observed compared to new products.

KEYWORDS

Building products, emission, VOCs, formaldehyde, use, ageing

1 INTRODUCTION

Indoor emissions from building products are conventionally characterized on new products. But ageing of building products in use in real buildings can change their surface properties and their emissions into indoor air. Although ozone induced surface reactivity on building materials has been identified and studied since the 90s (Weschler et al. 1992; Reiss et al. 1995; Lee et al. 1996), studies on the influence of surface reactivity on emissions of pollutants in indoor air remain scarce.

The aim of this research project was to characterize the impact of wear conditions and use of building products on their middle and long-term emissions indoors. Therefore, short-term emissions of new building products will be compared to their mid- and long-term emissions characterized through various scenarios of ageing.

2 MATERIALS/METHODS

One of the key points of this work was the definition of relevant ageing scenarios representative of realistic indoor conditions. Relevant parameters selected and test conditions applied were: temperature (23°C and 35°C), relative humidity (50% and 70%), lighting (dark or light), oxidant exposure (with and without ozone), mechanical wearing (according to ISO/FDIS 4918), using process (household products or sealant application), real ageing (indoor air office exposition).

These scenarios were applied to 5 selected floor coverings: resilient PVC floor covering, linoleum, wood laminate, raw exotic and pinewood parquets.

4 DISCUSSION

For specific scenarios, in particular those involving oxidation and high relative humidity exposure of linoleum and raw pine wood parquet, significant modifications of VOCs emissions were observed compared to new products. Consequently, these experiments will be repeated and additional metrology will be implemented to study the potential formation of volatile gaseous and particulate by-products. A specific methodology to characterize oxygenated organic compounds in both gaseous and particulate phases (Rossignol et al., 2012) and c-TOF AMS (Compact Time-of-Flight Aerosol Mass Spectrometer) to evaluate the potential formation of secondary organic aerosol (SOA) will be used. These experiments are in progress.

5 CONCLUSIONS

The impact of wear conditions and use of building products on their middle and long-term indoor emissions was studied for 5 floor covering: resilient PVC floor covering, linoleum, wood laminate, raw exotic and pinewood parquets. Different scenarios were tested: high temperature, high relative humidity, lightning, oxidant exposure, mechanical wearing, using, and real ageing (indoor air office exposition). For specific scenarios, in particular those involving oxidation and high relative humidity exposure, significant modifications of VOCs emissions were observed compared to new products.

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6 REFERENCES

- AFSSET. 2009. Composés organiques volatils et environnement intérieur – Procédure de qualification des émissions de composés volatils par les matériaux de construction et produits de décoration (<https://www.anses.fr/fr/system/files/AIR2004et0011Ra-2.pdf>).
- Decree n° 321-2011. Décret n° 2011-321 du 23 mars 2011 relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils. *Journal Officiel de la République Française*. 23 mars 2011.
- Lee D.S. et al. 1996. The potential impact of ozone on materials in the U.K.. *Atmospheric Environment*. 30 (7), pp 1053-1065.
- Lee Y.K., Kim H.J. 2012. The effect of temperature on VOCs and carbonyl compounds emission from wooden flooring by thermal extractor test method. *Building and environment*, Vol. 53, pp 95–99.
- Reiss R. et al. 1995. Ozone reactive chemistry on indoor latex paint. *Environmental Science and Technology*. 29 (8), pp 1906–1912.
- Rossignol S. et al. 2012. Development of parallel sampling and analysis for the elucidation of gas/particle partitioning of oxygenated semi-volatile organics: a limonene ozonolysis study. *Atmospheric Measurement Technique*. 5, pp 1459-1489.
- Weschler C.J. et al. 1992. Indoor chemistry: ozone, volatile organic compounds, and carpets. *Environmental Science and Technology*. 26 (12), pp 2371-2377.