

Characterization of glycol ether emissions from a water-based paint: chamber tests and field experiments

François Maupetit, Olivier Ramalho, Nathalie Bonvallot, Antoine Villa, Dominique Gombert

▶ **To cite this version:**

François Maupetit, Olivier Ramalho, Nathalie Bonvallot, Antoine Villa, Dominique Gombert. Characterization of glycol ether emissions from a water-based paint: chamber tests and field experiments. Healthy Buildings'2006, Jun 2006, Lisbonne, Portugal. pp.A521. hal-00697558

HAL Id: hal-00697558
https://hal.science/hal-00697558

Submitted on 15 May 2012

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Characterization of Glycol Ether Emissions from a Water-based Paint: Chamber Tests and Field Experiments

F. Maupetit[1], O. Ramalho[1], N. Bonvallot[2], A. Villa[2] and D. Gombert[2]

1Centre Scientifique et Technique du Batiment (CSTB), 84 avenue Jean Jaures, Champs-sur-Marne, F-77447 Marne-la-Vallee cedex 2, France, email: f.maupetit@cstb.fr. http://www.cstb.fr
[2]Agence Francaise de Securite Sanitaire de l'Environnement et du Travail (AFSSET), 253 avenue du GeneralLeclerc, F-94701 Maisons-Alfort cedex, France

Summary: *In order to document glycol ether emissions from a water-based paint, emission test chamber and field experiments were conducted. VOC identified in paint emissions were mainly propylene glycol, 1-(2-butoxy-1-methylethoxy)-2-propanol and 2-(2-butoxyethoxy)-ethanol. VOC emissions were high during and just after painting (e.g. propylene glycol concentrations > 10 mg.T[1]). Indoor concentrations were modelled using a simple sink model to document the influence of the air exchange rate: the higher the AER, the lower the indoor concentrations. High ventilation of the painted room or a delay before re-entering into a freshly painted room appear as simple but efficient recommendations for limiting exposure to water-based paints emissions.*

Keywords: *water-based paint, emission test chamber, field experiment, modeling*

1 Introduction

The purpose of this paper is to present the characterization of glycol ether emissions from a water-based paint as documented from test chamber methods and from a realistic field experiment and to study the influence of ventilation conditions on indoor concentrations.

2 Methods

Two layers of the selected paint were applied with a 24 hours interval on pre painted gypsum boards installed on the walls of a 32 m^3 test room of the CSTB experimental house (MARIA). Ventilation conditions were controlled by mechanical extraction during the experiment (air exchange rate =1.0 h^{-1}). The field experiment was simulated in an emission test chamber (COMPAQ). VOC were sampled on Tenax TA and analysed by TD/GC/MS/FID.

3 Results

Main identified VOC emitted by the tested paint were propylene glycol, a mix of isomers of 1-(2-butoxy-1-methylethoxy)-2-propanol (DPGBE) and 2-(2-butoxyethoxy)-ethanol (DEGBE). Indoor concentrations were high during and ~ 8 hours after application of the paint: e.g. propylene glycol concentrations > 10 mg.m"[3] (TWA WEEL, AIHA). Then, indoor concentrations sharply decreased during the first days after paint application. We observed a good agreement between results obtained under realistic conditions from the field experiment and from the emission test chamber, especially after 10 days (Figure 1). Indoor concentrations were modelled using a simple sink model [1]. For the three main identified VOC, we obtained a good agreement between modelled and measured concentrations (see the example of DPGBE on Figure 2). Three different air exchange rates (AER) were simulated using this model (5.0, 1.0 and 0.2 h^{-1}): the higher the AER, the lower the indoor concentrations.

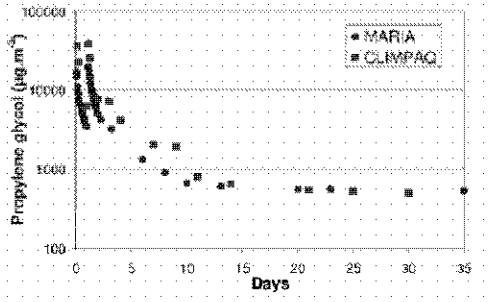


Fig. 1: Propylene glycol concentrations (µg.m^{-3}) measured in the experimental house (MARIA) and in the emission test chamber (CLIMPAQ).

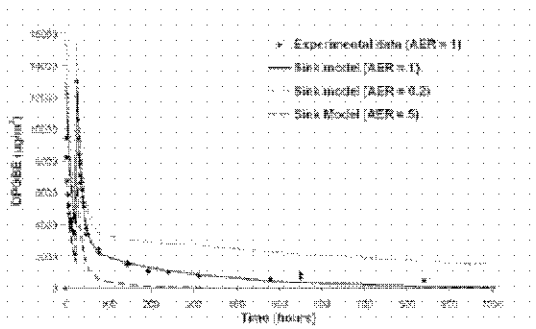


Fig. 2: Measured and modeled indoor DPGBE concentrations (µg.m^{-3}) depending on the AER (h^{-1}).

References

[1] J.E. Dunn and B.A. Tichenor. Compensating for sink effects in emission test chambers by mathematical modeling. *Atmospheric Environment* 22 (1988) 885-894.