

UNIVERSITI TEKNOLOGI MARA

**EFFECTS OF HIGH TEMPERATURE ON
FORMALDEHYDE AND ANTIMONY LEVELS IN
POLYETHYLENE TEREPHTHALATE (PET)
BOTTLED MINERAL WATER**

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ABSTRACT

Effects of High Temperature on Formaldehyde and Antimony Levels in Polyethylene Terephthalate (PET) Bottled Mineral Water

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INTRODUCTION: Mineral water is one of the popular choice for all. Occasionally, this bottle of mineral water would be left in a hot car and would result in the leaching of metal such antimony and carbonyl compound such formaldehyde. **OBJECTIVE:** The aim of this study were to determine the levels of formaldehyde and antimony in mineral water bottle (PET) due to in-car storage exposure and it health impact to public. **METHODOLOGY:** The data were collected regarding on the concentration of formaldehyde and antimony in the PET mineral water bottle for one and two weeks exposure. Those sample were stored in the car for two weeks. The concentration for both compound also been tested before storage. Besides that, the storage temperature factor also been taken over time which three times per day until the study was done. The GFAAS and UV-VIS were used for analyzed the concentration of antimony and formaldehyde respectively. The quantitative risk assessment was used for health risks analysis. **FINDINGS.** The mean concentration for formaldehyde slightly increased the in-car storage duration which are before storage, one week storage and two week storage for each brands. It aslo been proven that the leaching happened after the samples were stored in the car as there is no result before storage. However, all results were below the WHO standard which is 0.9mg/L. The formaldehyde concentration and different storage duration only have a fair correlation ($r=0.502$) while poor correlation ($r=0.214$) between the formaldehyde concentration and different brands. The antimony also below the WHO standard; 0.02mg/L. Nonetheless, the mean concentration of antimony was slightly increased by the in-car storage duration which are before storage, one week storage and two week storage for each brands same like formaldehyde. The antimony concentration and different storage duration only have a poor correlation ($r=0.228$) while poor correlation ($r=0.071$) between the antimony concentration and different brands. **CONCLUSION:** There are few factors that could cause the leaching which are temperature, sunlight irradiation, storage duration and the influence of the manufacturing technology and bottling process. The migration of this leaching compound may cause potential effect to consumer.

Keywords: Leaching, formaldehyde, antimony, health risk assessment

CHAPTER 1

INTRODUCTION

1.1 Introduction

Water is one of the elements that is essential in maintaining and supporting the organism's life. Malaysia produce 3000mm average annual of rainfall for he freshwater supply (Azrina et al., 2011). All water that is drinkable is called as potable water. Drinking water must be clean, free from impurities and drinkable without any side effects. Most of the drinking water needs to undergo water treatment and filtration process in order to ensure the quality of the drinking water.

Bottled drinking water has flooded the market in Malaysia. The main bottled water is Natural Mineral Water (NMW) and Packaged Drinking Water (PDW). Natural mineral water is are from groundwater resources and the bottle has been capped with multi-color cap. It contains various minerals such magnesium, calcium, potassium and others and must comply with Schedule 26 (Regulation 360(7)), Food Regulation 1985. However, PDW are potable water or treated potable water and packed with white caps (Subramaniam, 2007). Mineral water bottle has become the popular choice among the world population as it is portable, clean and contain various mineral (Huber, 2010).

PET or Polyethylene terephthalate which is semi-crystalline polymer belongs to the family of polyester is the most favorable packaging material for drinking water (C. Bach, Dauchy, Chagnon, & Etienne, 2011). According to Royte (2008), PET is a polymer that derived from oil that adds flexibility, color and strength to plastic (Huber, 2010). Moreover, the plastic is more resistant to heat, mineral oils, solvents and acids, impermeable to carbonation, strong, light, naturally transparent and also completely