

Release of organic contaminants migrating from polyvinyl chloride polymeric into drinking water under three successive stagnant periods of time

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ABSTRACT

Drinking water is found contaminated with various volatile organic compounds (VOCs) at supply end. Chlorinated polyvinyl chloride (CPVC) and polyvinyl chloride (PVC) pipes used to supply drinking water may be the possible source of the contamination. In this study, leaching ability of VOCs from CPVC and PVC was tested under controlled experimental conditions and correlated with real water samples. For experimental design, nine polymeric plastics in Saudi Arabia were purchased locally and incubated with pure water for leaching study. A total of 58 tap water samples were collected from buildings and villas within the city of Madinah Al-Munawwarah and analyzed for the targeted compounds including benzene, 2-butanone, 1,1,1-trichloroethane, pyridine, 1,2-dichloropropane, 1,1,2,2-tetrachloroethane, 1,2,3-trichloropropane, phenol, benzyl chloride, 2-nitrophenol, 2,4-dichloropropane, and 2,4,6-trichlorophenol. Analytical results show that volatile and phenolic contaminants released by tested pipes increased significantly over incubation time. The quantification of the targeted compounds in Milli-Q water samples incubated in pipes in laboratory-scale experiment conformed that these contaminants are more likely to be migrated from PVC plastic pipes comprising tap water. The levels of some contaminants were above the limits stated by World Health Organization, while others were within the allowable levels. Their accumulation during longer contact time can potentially increase the exposure to harmful constituents in water and causes health problems. The results also indicated a correlation between the source of contamination and level of pollutants.

Keywords: Organic contamination; Water quality; VOCs; Phenols; Plastic pipes; Kingdom of Saudi Arabia

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