

Biocides in Food Packaging: Safety Concerns and Migration Insights



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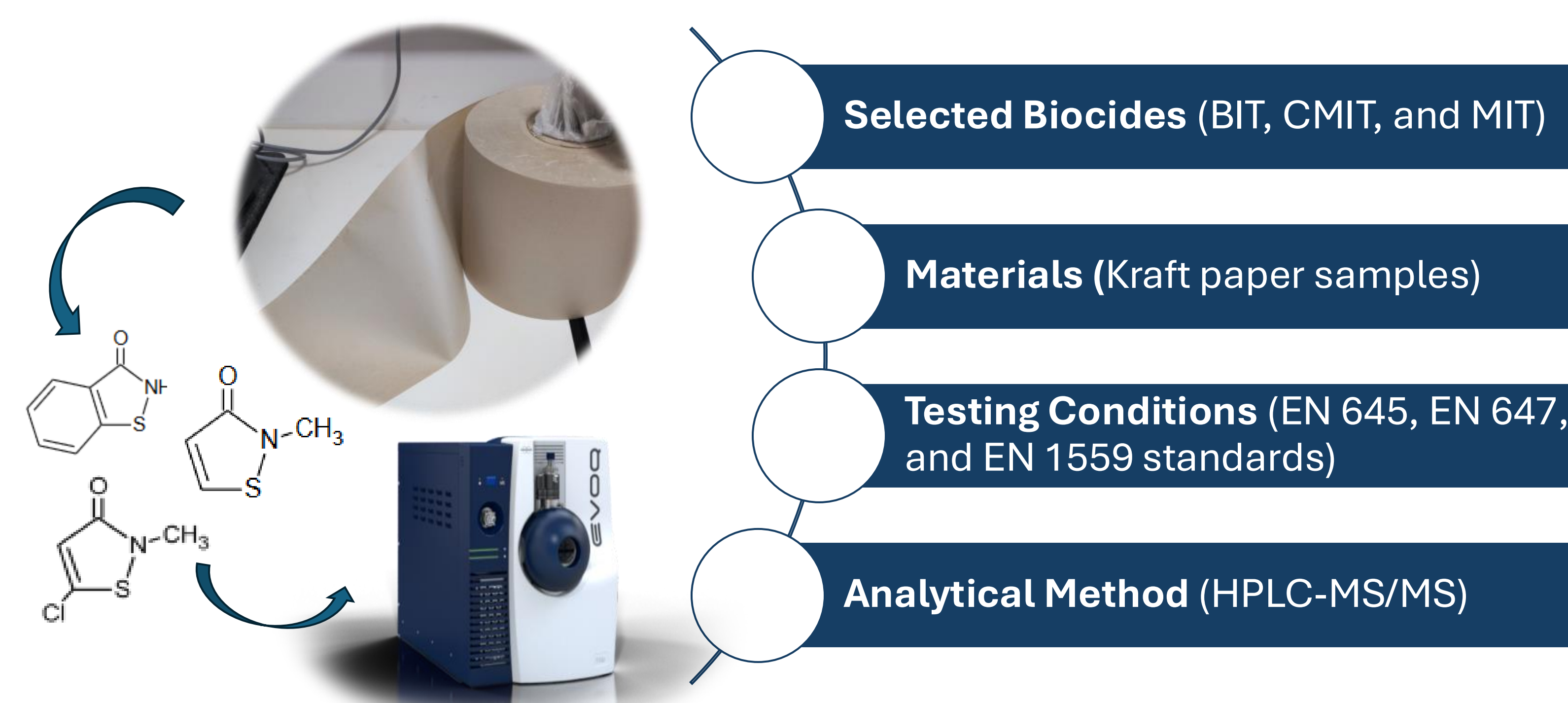
Introduction

Context: Biocides such as BIT (1,2-Benzisothiazolin-3-one), CMIT (Chloromethylisothiazolinone), and MIT (Methylisothiazolinone) are commonly used in food packaging to preserve materials and ensure safety due to their antimicrobial properties.

Problem: The potential migration of these biocides into food contact materials (FCMs) raises concerns, especially since their behavior under various conditions is not well understood.

Objective: This study aims to characterize the extraction behavior of BIT, CMIT, and MIT from Kraft paper, focusing on its potential migration when used in food packaging.

Methods



Results & Conclusions

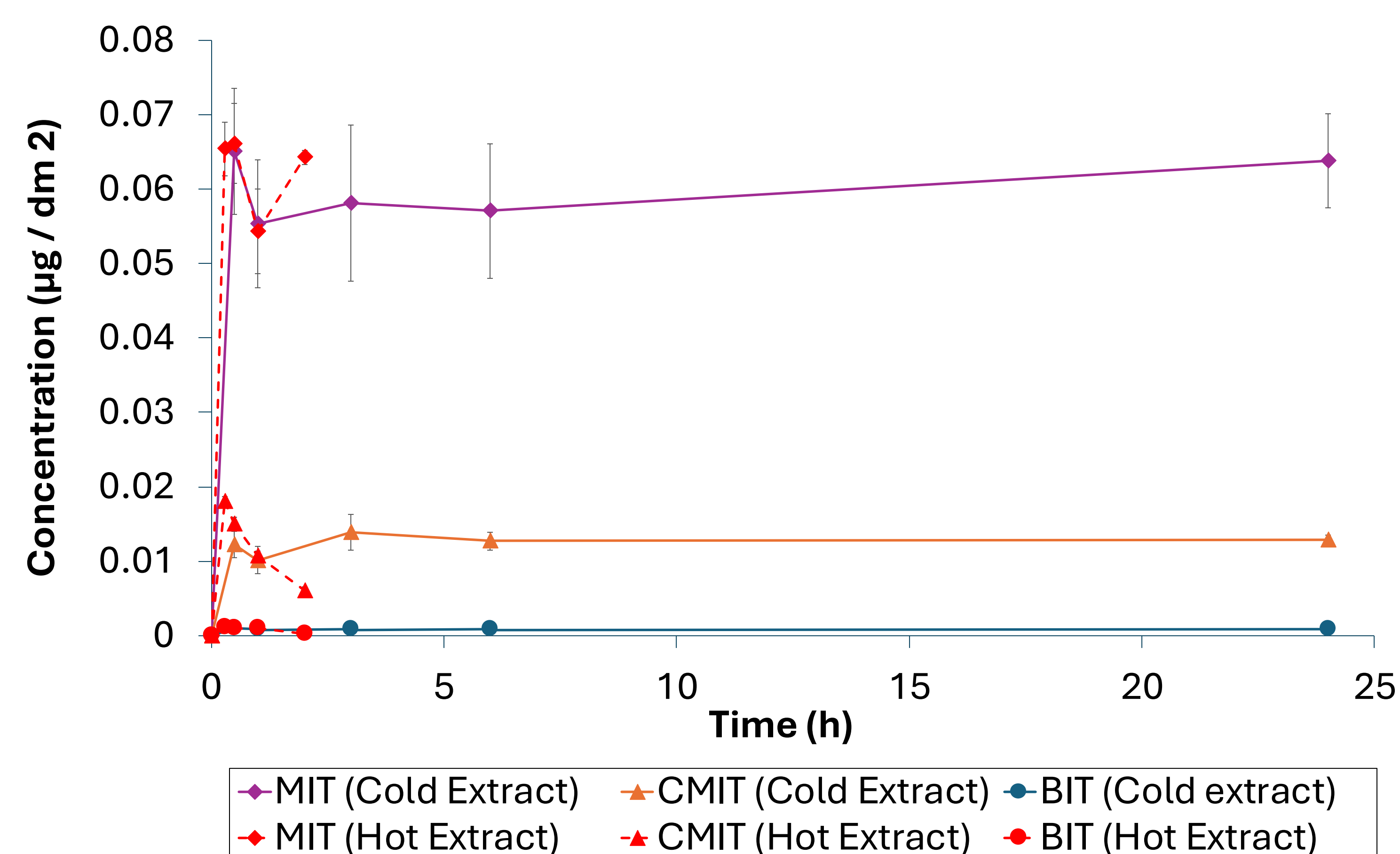


Figure 1 - Kinetic extractions of biocides BIT, CMIT, and MIT from Kraft paper samples (n=5) after immersed in cold water for 24 h (EN 645) and hot water for 2 h (EN647).

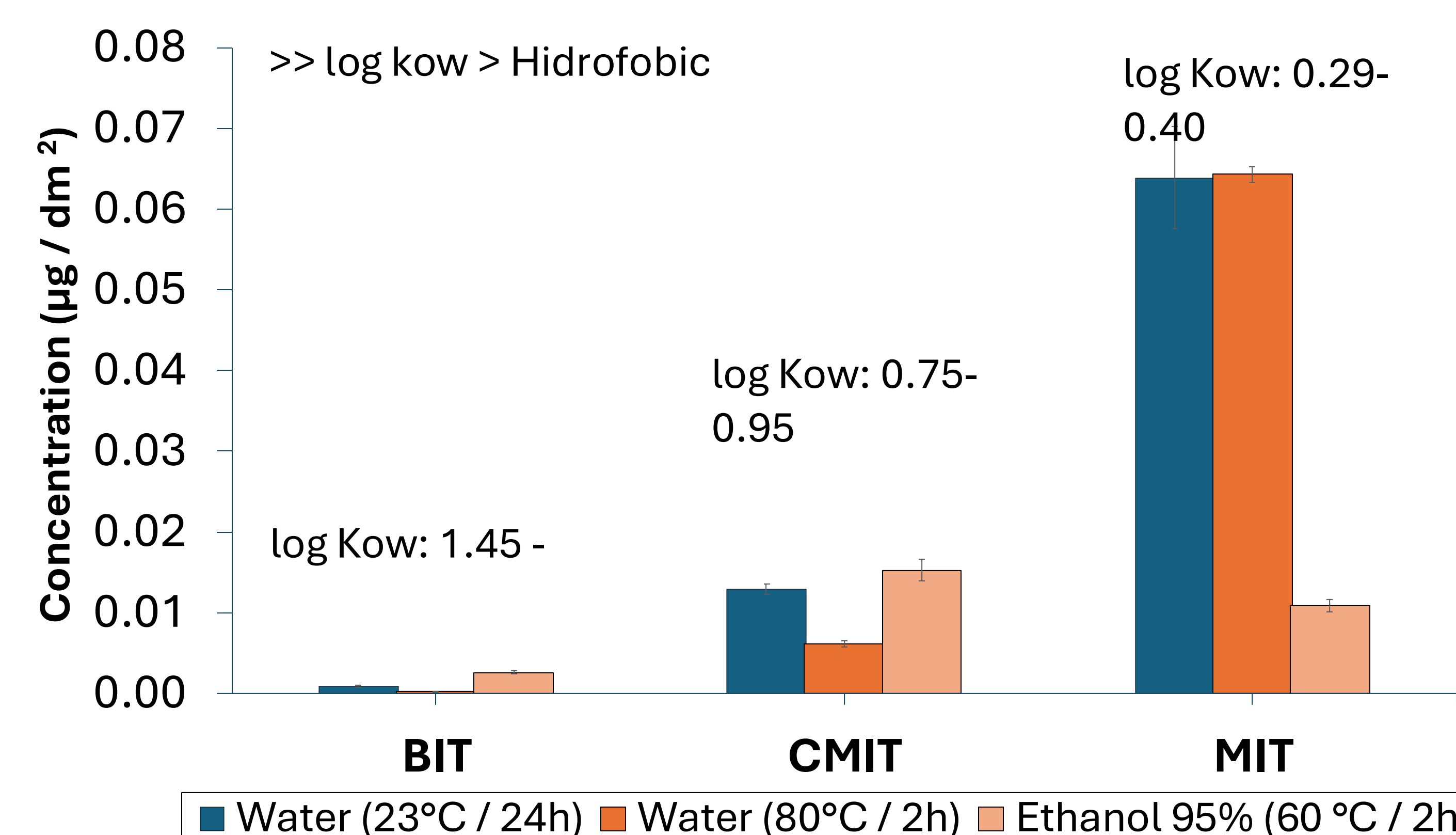


Figure 2 – Concentration of the biocides BIT, CMIT, and MIT present in the kraft paper samples (n=5) after contact with cold water for 24h (EN645), hot water for 2 h (EN 647) and Ethanol 95% for 2 h (EN 1559).

Cold and Hot Water Extractions:

- MIT was the most prevalent biocide, suggesting higher water affinity.

Influence of Temperature:

- Higher temperatures (e.g., hot water extraction) may cause degradation or adsorption of biocides to the paper matrix, affecting extraction and migration rates.

95% Ethanol Extraction:

- BIT and CMIT exhibited significantly higher extraction, indicating greater solubility in ethanol.
- MIT showed reduced extraction due to its hydrophilic properties and lower ethanol affinity.

Log Kow Values:

- BIT (1.45 - 2.20) and CMIT (0.75 - 0.95) favor extraction in ethanol. MIT (0.29 - 0.40) has limited extraction due to higher water affinity.

The extraction of biocides from food packaging materials is influenced by the solvent type, temperature, and biocide properties (e.g., log Kow). BIT and CMIT showed higher solubility and extraction in ethanol, while MIT has a stronger affinity for water, reducing its extraction in ethanol. The complex interactions between temperature, solvent type, and the Kraft paper matrix affect biocide availability and migration patterns. Findings highlight the need for rigorous standards in food safety regarding biocide use in food packaging, emphasizing the need for further research of biocide behavior migration in various matrices.

Acknowledgments:

Authors thanks the support granted by the Recovery and Resilience plan (PRR) and by the Next Generation European Funds to Universidade Católica Portuguesa, through the Green Agenda for business innovation "From Fossil to Forest – Sustainable packaging and products to replace fossil plastic" (Project no. 8 with application C644920945-00000036). Also thanks the support granted by the COST (European Cooperation in Science & Technology).

