
Airborne emissions of microplastic fibres from domestic laundry dryers

Stacey O'brien^{*1,2}, Elvis Dartey Okoffo³, Jake W. O'brien³, Francisca Ribeiro⁴, Xianyu Wang³, Stephanie L. Wright⁵, Saer Samanipour^{3,6}, Cassandra Raeurt³, Tania Toapanta³, Rizsa Albarracin, and Kevin V. Thomas³

¹Queensland Alliance for Environmental Health Sciences – The University of Queensland, 20 Cornwall Street, Woolloongabba, QLD, 4102, Australia

²Queensland Alliance for Environmental Health Sciences – The University of Queensland, 20 Cornwall Street, Woolloongabba, QLD, 4102, Australia

³Queensland Alliance for Environmental Health Sciences – 20 Cornwall Street, Woolloongabba QLD, Australia

⁴Queensland Alliance for Environmental Health Sciences – 20 Cornwall Street, Woolloongabba QLD, Australia

⁵Imperial College London – MRC Centre for Environment and Health, Imperial College London, London SE1 9NH, United Kingdom

⁶Faculteit der Natuurwetenschappen – Wiskunde en Informatica Van 't Hoff Institute for Molecular Sciences, Netherlands

Abstract

An emission source of microplastics into the environment is laundering synthetic textiles and clothing. Mechanical drying as a pathway for emitting microplastics, however, is poorly understood. In this study, emissions of microplastic fibres were sampled from a domestic vented dryer to assess whether mechanical drying of synthetic textiles releases microplastic fibres into the surrounding air or are captured by the inbuilt filtration system. A blue polyester fleece blanket was repeatedly washed and dried using the 'Normal Dry' program of a common domestic dryer operated at temperatures between 56 and 59 °C for 20 min. Microfibres in the ambient air and during operation of the dryer were sampled and analysed using microscopy for particle quantification and characterisation followed by Fourier-Transform Infrared Spectroscopy (FTIR) and Pyrolysis Gas Chromatography-Mass Spectrometry (Pyr-GC/MS) for chemical characterisation. Blue fibres averaged 6.4 ± 9.2 fibres in the room blank (0.17 ± 0.27 fibres/m³), 8.8 ± 8.5 fibres (0.05 ± 0.05 fibres/m³) in the procedural blank and 58 ± 60 (1.6 ± 1.8 fibres/m³) in the sample. This is the first study to measure airborne emissions of microplastic fibres from mechanical drying, confirming that it is an emission source of microplastic fibres into air – particularly indoor air.

Keywords: Microplastic Emission Air Fibre Dryer Pyr, GC/MS

*Speaker