

# Protocol for the Recovery and Quantification of Microplastics Released During the Washing of Synthetic Fabrics

## 1. Introduction

Fibrous microplastics are increasingly recognized as a serious environmental issue, having been found in marine organisms, agricultural soils, the atmosphere, and even remote regions such as Arctic glaciers. Recent scientific research has developed specific methods to quantify the microplastics released from synthetic fabrics during domestic washing processes [<https://doi.org/10.1038/s41598-019-43023-x>]. These studies have made it possible to correlate the release of microfibers with the chemical composition of the fabric, textile properties, the type of detergent used, washing conditions, and the size of the laundry load.

## 2. Materials

- Washing machine
- Fabrics of various chemical compositions (e.g., cotton, polyester)
- 30-liter containers
- Analytical balance
- Stainless steel sieves (400  $\mu\text{m}$ , 60  $\mu\text{m}$ , 20  $\mu\text{m}$ )
- Distilled water
- Petri dishes (preferably glass)

## 3. Procedure

The protocol involves using a washing machine and different types of fabrics, such as cotton and polyester. Before washing, fabric samples are weighed. Two tanks to recover wastewater of at least 30 liters are cleaned with distilled water, and a set of stainless steel sieves with different pore sizes (400  $\mu\text{m}$ , 60  $\mu\text{m}$ , and 20  $\mu\text{m}$ ) is stacked from largest to smallest and placed in a sink. The fabric is then placed in the washing machine with the recommended amount of detergent. A standard washing cycle is run at 40°C and a spin speed of 800 to 1000 revolutions per minute.

At the end of the cycle, the wastewater is filtered through the stacked sieves. Microfibers retained by the sieves are rinsed off using distilled water. These microfibers are then transferred into glass petri dishes, where they are sorted according to the sieve mesh size. The collected microfibers are left to dry at room temperature for two days. Once dried, they are weighed using an analytical balance. A portion of the microfibers is observed under a microscope, and their images are captured.

Image-J analysis software is used to measure the length and diameter of the fibers. Based on these measurements and the known mass of the fabric and recovered fibers, it is possible to estimate the number of microfibers released. This is done by assuming the fibers are cylindrical in shape and calculating their volume accordingly.

*The present protocol was drafted by [CNR](#).*

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