



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

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Project Title Shedding of Polymeric Microfiber Particulate from Synthetic MTLs: Dryer Emissions as a Source of Environmental Pollution	
<p style="text-align: center;">Abstract</p> <p>Objectives This study examined the shedding and emissions of plastic microfiber particles from different synthetic materials during dryer cycles in order to determine the efficacy of internal filtration systems in preventing microfiber particulate emission into the environment.</p> <p>Methods Test materials were washed and then dried in an electric compact tumble dryer with an attached dryer vent duct. The Lighthouse Handheld 3016 (LH3016) particle counter was used to quantify particulate levels. In a clean zone, constructed with sealed plastic sheeting, control tests were run before all dryer cycles. The LH3016 was placed at the opening of the vent gathering particulate which escaped internal filtration mechanisms. Multiple cycles were tested for each material so that data could be organized and graphed. A range of filters were employed as potential abatement strategies and emissions were then quantified.</p> <p>Results Tests indicated that all synthetics produced significant particulate levels. Internal filtration was determined to be ineffective at preventing the emission of micro particle emission during dryer cycles. Furthermore, multiple washings and dryings did not reduce shedding, in fact, particulate emissions increased as materials were subjected to increased wear. Testing indicated that low grade air filters did not reduce particulate emissions; some may release their own micro particulate which would account for increased particulate levels. However, higher grade filters were substantively successful at particle reduction.</p> <p>Conclusions Results indicate that the use and cleaning of synthetics increases deterioration and shedding. Testing establishes that the micro-particulate that is shed is small enough to bypass internal filtration systems in a domestic dryer, successfully travel out of traditional ventilation ducts, and will be released into the environment. The rapid growth in the use of synthetic materials, domestically and abroad, is therefore leading to rapid increase in the prevalence of the release of these synthetic fibers into the environment. A low cost abatement strategy might be feasible for domestic dryers if it is attached near the duct opening. Given the mounting evidence that synthetic micro-particulate is detrimental to the health of organisms, it is prudent to pursue any strategies that may reduce the effect of the rising use of synthetics.</p>	
Summary Statement I evaluated domestic dryers to determine if polymeric microfibers are released from synthetic materials during dry cycles, and tested air filters as an abatement strategy.	
Help Received 1. Ruth Gramajo: teacher at Portola who supported process; 2: Jason Feldman: mentor who assisted in obtaining testing equipment to borrow from JPL, gave advice on process; Axel Scherer: CAL Tech professor who developed new spectrometer. This device could perform qualitative analysis of field	