

## Print documents, or print microplastics?

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Microplastics (1  $\mu\text{m}$  – 5 mm) distribution in the aquatic system, the terrestrial environment and in the atmosphere have significantly elevated in recent decades. Microplastics are highly durable in the environment. They can release monomers, additives and other toxic chemicals. Moreover, they have potential to adsorb and accumulating other environmental pollutants. Human exposure to microplastics could be through the food chain (ingestion) or air due to the inhalation of the atmospheric fallout. Pervious researches suggest that printer toners are also a potential source of environmental pollutants as they can release volatile particles into the air. Toner powders contain organic carbon and inorganic content. The organic carbon is a significant portion of the printer powders (50 -90%) and they could be related to polyester resin mixture or styrene acrylate copolymer. The aim of this study is to understand the potential of microplastics to be printed on the paper from the toner polymer formulation. Thus, we employed SEM, TEM, XPS, FT-IR, TGA and Raman to characterise the toner-printed microplastics. Using Raman spectroscopy, it was possible to distinguish and visualise the distribution of the microplastics from the toner powder with almost no interference from the background spectrum of paper fabrics and the fluorescence of the pigments. We estimate the millions of toner powders, with the size of approximately 4-6  $\mu\text{m}$ , are printed out per A4 sheet as microplastics. The findings send a strong warning that millions of microplastics might be generated from the printing activities in our daily lives.