# Measuring the Density of Environmental Microplastics

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**Abstract**

A key particle property in determining the fate and transport of microplastics is their density. A wide range of densities exist in virgin plastic resins, and their density is potentially altered by manufacturing and environmental processing. Being able to accurately report microplastic density will improve interpretation of how and why microplastics are found in samples where they might not be predicted to occur based on their density. However, measuring the density of particles is complex and difficult, and therefore the density of microplastics is rarely measured.
The use of density gradient columns to measure particle density is an established technique but has not yet been utilised within the microplastics field. Utilising a density column filler (H&D Fitzgerald), a series of density gradients were established and calibrated using known density floats.

These density gradient columns were used to measure the density of microplastics recovered from a beach in Southampton, UK. Microplastics were sampled from a small urban gravel beach at the high tide debris line and in a patch of grass above the debris line that was heavily contaminated. Microplastics were predominantly pre-production pellets likely associated with industrial spillages, with smaller proportions of foams and fragments of larger debris. A range of colours were recovered, with varying degrees of weathering and biofilm development. Recovered microplastics were primarily low-density ($<$ 997 g/cm3) and colourless translucent pellets. Observations included the adhering of large sediment particles to pellets which increased particle density. The highest density particles ($>$ 1200 g/cm3) were only found in the high tide debris sample with the grass sample showing a lower average density. This work supports the feasibility of a simple and replicable technique to measure plastic properties that are under-represented in the literature. Accurately measuring microplastic density will enable improved modelling of microplastic transport and fate.

**Keywords:** microplastics, density

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