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AFM imaging of exhaled microdroplets and dry residues collected by impactor

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Abstract

Here we describe how individual sub-micron exhaled droplets and dry residue particles (DRPs) could be quickly collected on mica, glass, highly oriented pyrolytic graphite, and carboxymethyl cellulose film using a simple impactor. Most collected DRPs had size between 200 nm and 1000 nm and were readily seen under a low power optical microscope with dark-field illumination. The size and shape of the collected DRPs were analyzed with atomic force microscopy (AFM). It was found that the collection efficiency and the shape of the collected DRP depend on a number of factors, including (i) temperature and humidity of exhaled air, (ii) substrate temperature, and (iii) substrate hydrophobicity. Exposure of collected DRPs to humid air or to high temperature resulted in their spreading over the substrate surface, revealing the presence of lipid monolayers and solid nanoparticles inside the DRPs.

Graphical Abstract