How much plastic have you drunk today?

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How Much Plastic Have You Drunk Today?

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Abstract

Worldwide, one in three people do not have access to safe drinking water [1], resulting in the deaths of nearly 1000 children every day. Standard tests can take several days to produce a result [2], by which time it is often too late since the contaminated and polluted water has already been used. Hence, there is a clear need for rapid and specific testing that can produce results in real time. Here, we focus on microplastics pollution in drinking water. A typical pollution pathway is shown in Fig. 1 [3].

Our project utilises ultrafast broadband coherent anti-Stokes Raman scattering (CARS) spectroscopy [4] combined with digital imaging, aimed at detecting quantitatively and qualitatively the presence of microplastics in flowing drinking water. Autonomous operation requires to train computer systems, for which precise reference data of such pollutants and contaminations are needed. Hence, we present high quality reference Raman spectra and digital volumetric images microplastics in water, using scanning Raman spectroscopy and an advanced version of digital holographic microscopy.

Both the Raman spectra and the volumetric 3D images will be utilised as training data sets for an artificial neural network, enabling world first real time detection of microplastics in flowing drinking water. This will enable faster feedback to water suppliers than before, allowing water treatment plants to rapidly countermeasure.

Fig. 1: Typical microplastic pollution pathway, showing the manufacturing, breakdown and injection into water streams – which we drink.

Keywords: Digital holographic microscopy, Coherent anti-Stokes Raman scattering spectroscopy, holography, water, contaminants, microplastics, bacteria, toxins, biology.

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