

# **Linking physical and chemical characteristics of single small microplastics or nanoplastics via photolithographic silicon substrates**

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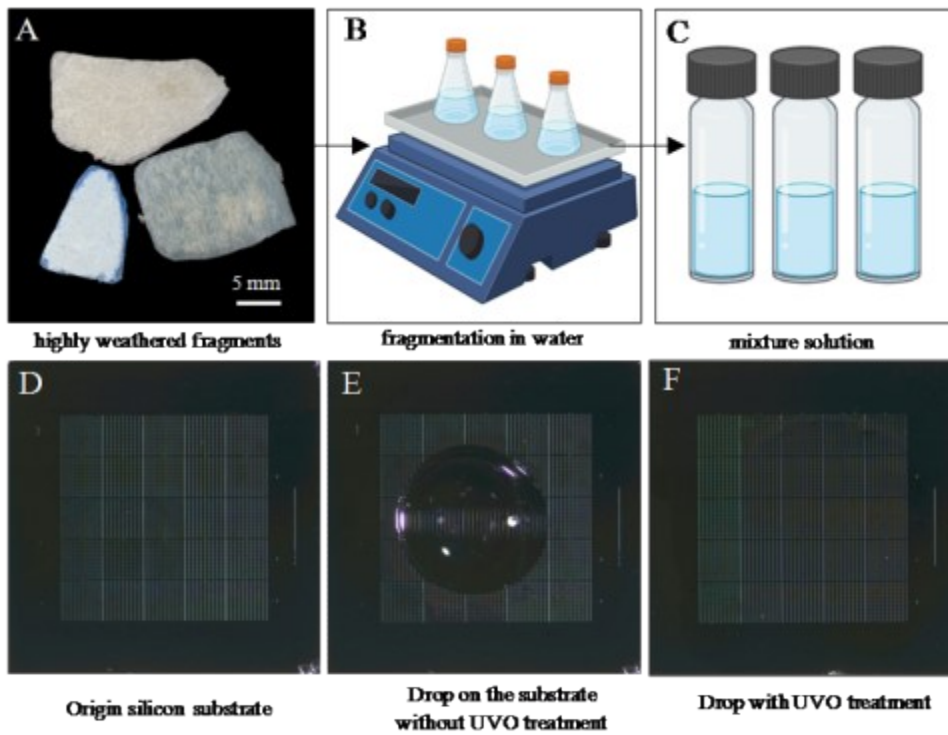
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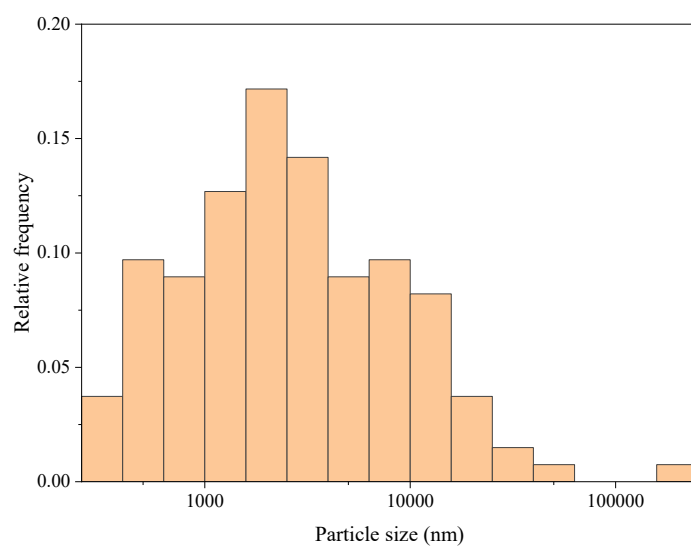
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**Table S1 The detailed methods for characterizations of tiny particles via multiple instruments**

instruments	parameters
Scanning Electron Microscope (SEM)	The images were taken with an optimized acceleration voltage of 2-5 kV and detector working distance of approximately 2-7 mm
Energy Dispersive Spectroscopy (EDS)	The scanning mode was conducted with an optimized acceleration voltage of 5 kV and a detector working distance of 6.9 mm.
micro-Raman Spectroscopy ( $\mu$ -Raman)	Raman was set at 532 nm excitation laser with 64 s integration time and laser intensity of 10-25%.
Atomic Force Microscope (AFM)	The scanning was conducted at tapping mode with scanning rate of 1 Hz and 512 lines per sample(model: TESPA-V2)



**Figure S1** A flowchart of sample preparation from raw fragments to mixture solution (A-C), the appearance of silicon substrate (D) and the load of samples on the substrates with and without UVO treatments (E-F)



**Figure S2 The size distribution of particles in two major areas**

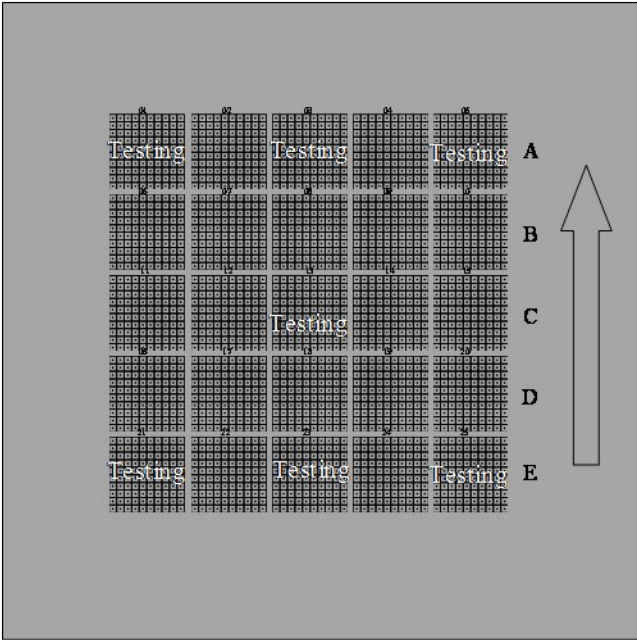
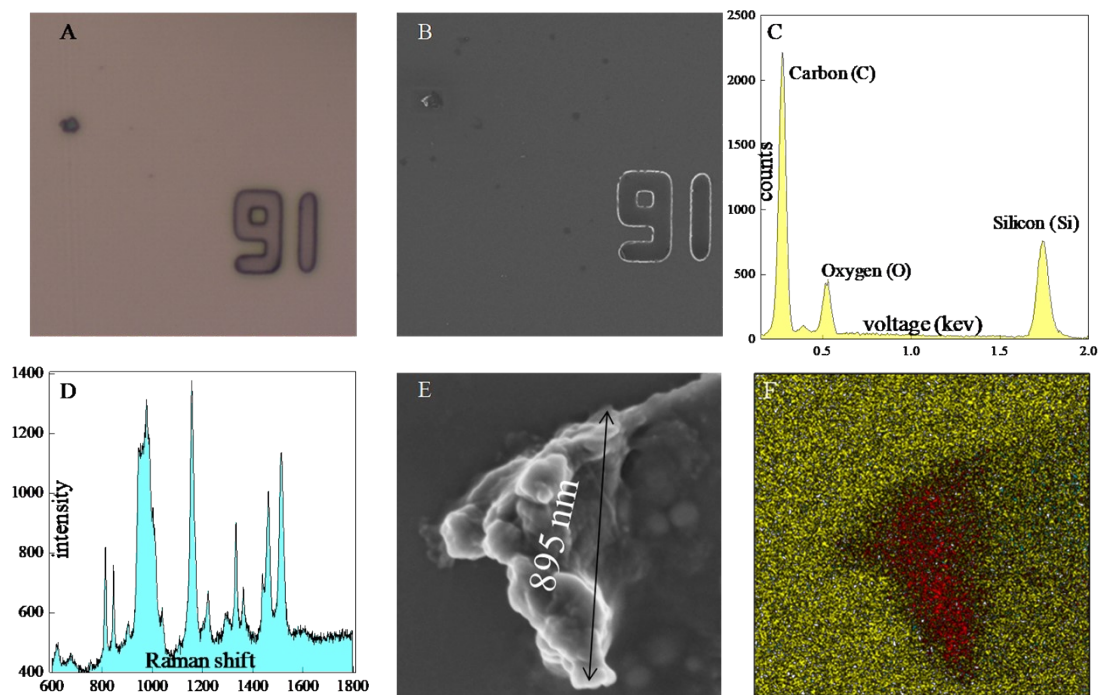
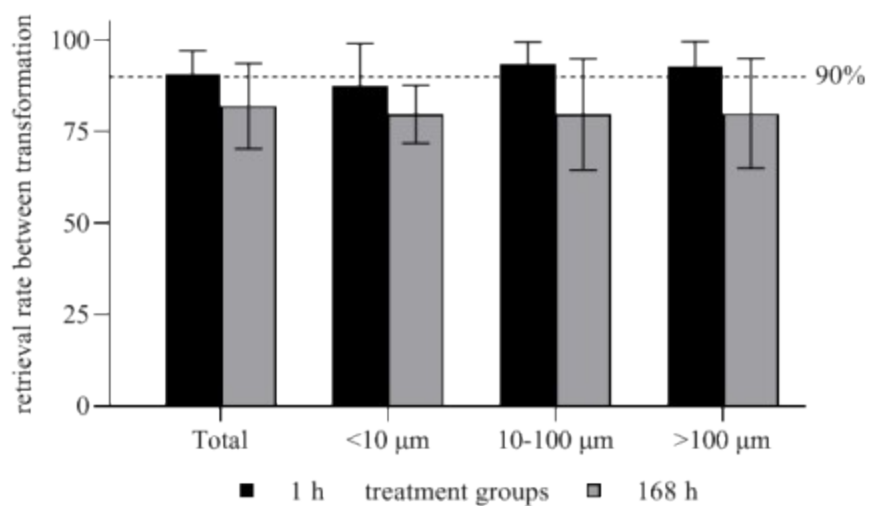


Figure S3 The testing areas used for retrieval test



**Figure S4** The characterizations of particles at minor cell 91# via micro-Raman spectroscopy and scanning electron microscope. The particle positioning at low resolution level was given in optical microscope associated to Raman spectroscopy (A). Raman spectrum was given in (D) while the high-resolution images of single particle were given in (B and E); The major elements distribution on the particle's surface (C) and inspecting area (F) was given in energy spectrum and color mapping where Carbon, Oxygen and Silicon was differentiated by color dots.



**Figure S5** The retrieval rates for the characterizations of SMPs between instruments