

Water Film Device for Continuous Particulate Matter Collection

Background

There are many kinds of particulate matter (PM) contained in aerosol and they can have tremendous impact on human health. Among them, PM below 2.5 μm in size is particularly harmful because it can drift in the air over long periods of time and penetrate human bronchi and lungs due to the small size. Long-term exposure of PM2.5 would increase the health risk.

Recently, there have been reports about removing PM2.5 from the air using filters, however, these systems will not be suitable for practical use since long-term use requires no clogging and no re-entrainment filters.

Technology Overview

Nagoya University researchers have developed a continuous PM2.5 collection system from aerosol using a water film within the device. The water film is formed by a superhydrophilic surface and enables the collection of PM2.5 from gas phase.

The device has millimeter-scale channels and a long-term stable superhydrophilic surface formed by titanium oxide (TiO₂)-covered zinc oxide (ZnO) nanowires to make a parallel flow of gas and liquid phases. The superhydrophilic surface allows the formation of a stable liquid phase within the channel and collects PM2.5 from gas phase. This device would be a new platform for collecting harmful PM from the air and keeping air condition clean.

Further Details

20th International Conference on Miniaturized Systems for Chemistry and Life Sciences 9-13 October, 2016, Dublin, Ireland

Seeking

Licensing

IP Status

Patent application submitted

Patents

An international patent application PCT/JP2017/009293 has been filed.

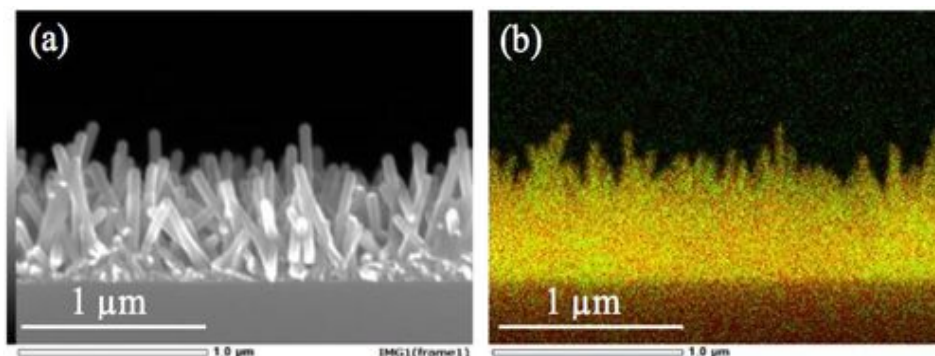


Figure 1: (a),(b) SEM and EDS images of cross-section of TiO₂-covered ZnO nanowires substrate.

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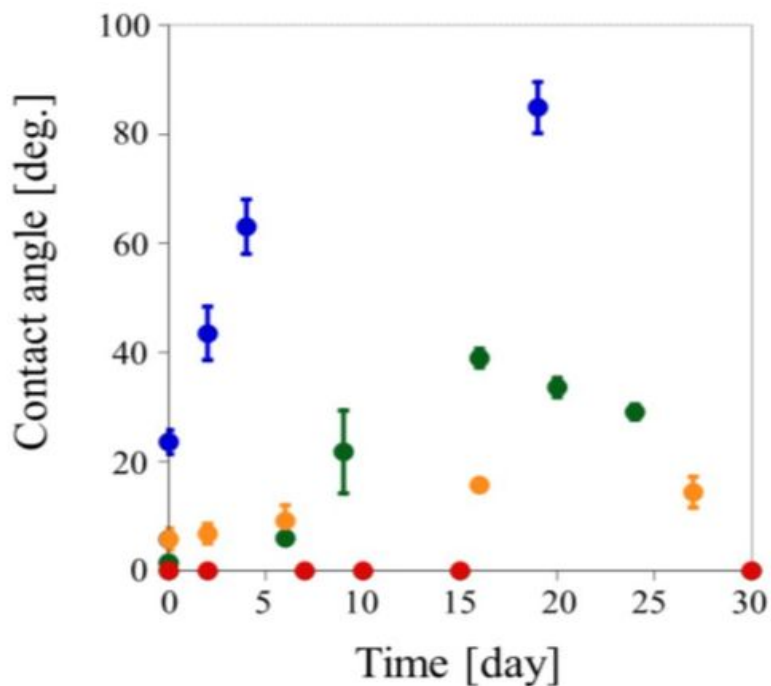


Figure 2: Measuring contact angle in response to elapsed days stored under the condition of dark state and atmosphere (blue dots: flat ZnO substrate, green dots: flat TiO₂ substrate, orange dots: ZnO nanowire substrate, red dots: TiO₂-covered ZnO nanowires substrate)

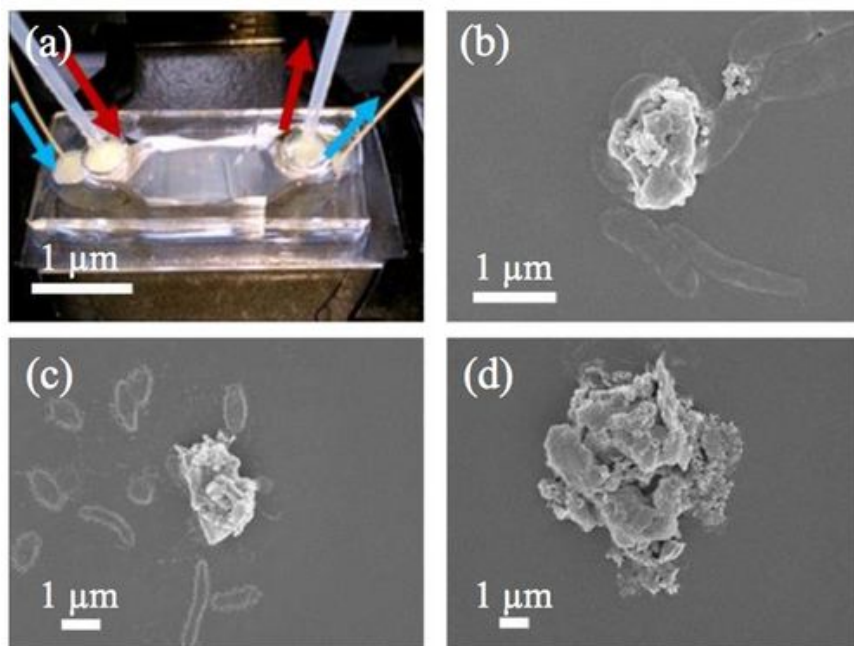


Figure 3: (a) Optical image of the fabricated device (Red arrows: pass of air phase, blue arrows: pass of liquid phase). (b)-(d) SEM images of collected PM_{2.5} from the recovered water.

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