MONASH University

MONASH INNOVATION

ULTRASTRONG ADHESION OF NANOWIRES

A method of forming nanowires on a substrate, where the substrate is initially in a semi-cured state that forms an ultra-strong bond when cured. This ultra-strong bond can make nanowire electrodes extremely durable and very strain-insensitive over a large number cycles and therefore ideal for use as a wearable sensor or elastic electronic connector.

- **Highly durable**
- **Strain insensitivity**
- **No solvents in production**
- **High conductivity**

THE CHALLENGE

Wearable sensors need to highly durable in order to withstand the wear and tear of normal activity of the end-user. The challenge is to develop a nanowire electrode which can withstand knocks while also maintaining high performance capability.

Existing nanowire growth methods include a solvent to functionalize the surface of the substrate and also require high temperatures in the preparation.

THE TECHNOLOGY

Monash researchers have developed a method of growing gold nanowires such that they can be embedded into a semi-cured PDMS substrate (Figure 1). The method does not require a solvent nor high temperatures; the substrate can therefore be semi-cured when depositing the nanoparticles, prior to growing the nanowires.

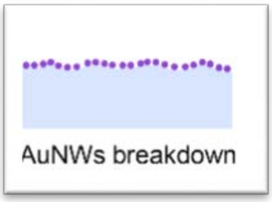

Figure 1. Deposition on a semi-cured substrate

The nanoparticles are the seeds of the nanowire growth and as shown in Figure 2, the stems of the nanowires become embedded in the PDMS so that when cured they are strongly bonded. The result is that the bonding strength of the nanowires is up to 15 times greater than other methods of attaching nanowires to an elastic substrate.

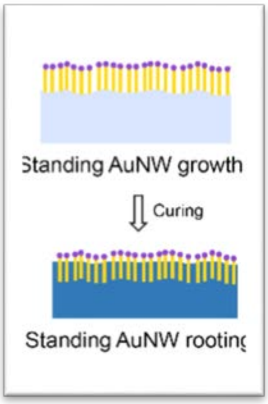

Figure 2. Nanowires become embedded resulting in strong bonding once cured.

Figure 3 compares the current method to various other methods used in this field and shows massive improvement. The adhesion strength is also directly relatable to durability of the sensor.

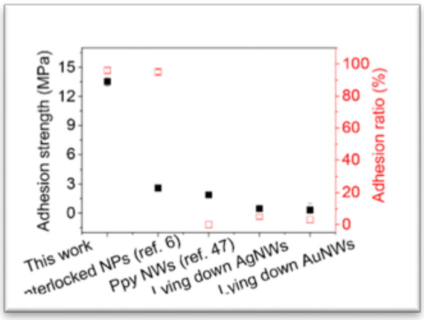

Figure 3. Comparison with other methods.

When bonded to an elastic substrate this new method also shows significant strain insensitivity and remarkable consistency of conductivity up to 300% strain (Figure 4).

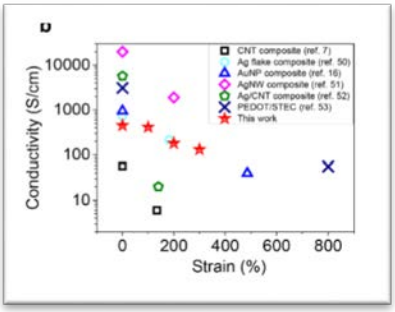

Figure 4. Graph comparing strain insensitivity with other techniques.

Intellectual Property: Australian provisional patent AU2019901857.

THE OPPORTUNITY

Monash seeks a partner to assist in the commercialisation of this technology.

The Monash Team is led by Prof. Wenlong Cheng, a world leader in the development of nanowire technology.

GROUP OF EIGHT AUSTRALIA

CONTACT US

Monash Innovation
T: +61 3 9905 9910
E:innovation@monash.edu
monash.edu/industry