Researchers develop versatile method for developing new materials

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Researchers at the University of Twente research institute MESA+ have devised an elegant method for fitting various functional coatings to silicon microwires. The method makes it possible to create relatively easily a wire that is coated on its lower side with platinum, for example, and with silver on top. The wires can be used potentially for generating renewable energy or for purifying water. The research has been published today in the prestigious scientific journal *Advanced Materials*.

Microwires made of the semi-conductor silicon are used in numerous fields. It is generally necessary to 'functionalize' them, by adding a layer of metal or a layer of a catalyst. In most cases, the wires are given a single layer, but in specific instances it is useful to put a different material on the bottom and on the top of the wires. However, creating these wires proved very difficult and the process of making them involved many steps. Researchers from the University of Twente have now developed a new method that makes creating wires of this kind easy. According to University of Twente Professor Jurriaan Huskens, this has provided chemists with a versatile method for creating new materials.

Different coating

A semi-conductor consists of silicon with what is known as a PN junction. This means that one side of the material has a P-type contamination (with the chemical element boron, for example) and the

other an N-type contamination (such as phosphorus). In their experiments, the University of Twente researchers first made microwires with a PN junction halfway along the wires. By using the various photoelectric characteristics of the two sides of wires in a smart way, it was possible to put different coatings on the two sides. In the experiment, the wires were submerged into a solution containing platinum in the dark, causing the 'P side' of the wire to be covered in platinum. In the next stage, silver was added to the other side in the light. The result was a microwire with silver on the top and platinum on the bottom. The method can, if chosen smartly, also be used for attaching other metals or catalysts to the wires. The wires can be very valuable for the purpose of generating energy from sunlight or purifying water with the help of sunlight.

More information: Alexander Milbrat et al. Spatioselective Electrochemical and Photoelectrochemical Functionalization of Silicon Microwires with Axial p/n Junctions, *Advanced Materials* (2015). DOI: 10.1002/adma.201504609

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