Newly proposed strategy offers smart flexible neural electrode with high efficiency

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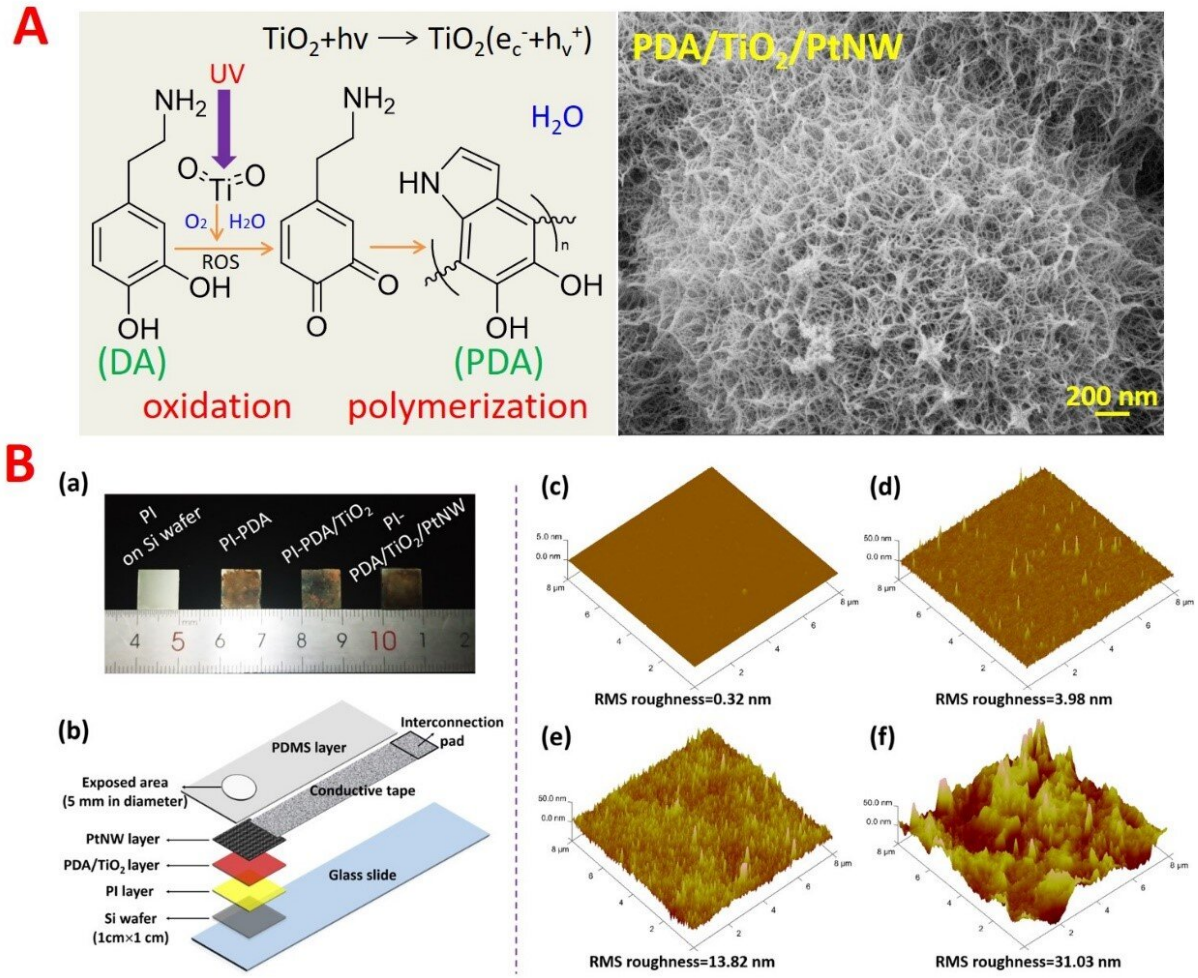

A. (a) Schematic diagram of accelerated PDA polymerization with nano-TiO_2 and UV, (b) SEM of PDA/TiO_2/PtNW modified electrode. B. (a) Samples of different coated electrodes (1 cm × 1 cm). (b) Schematic diagram of the working electrode (WE) for the electrochemical test. AFM images of (c) Ti/Pt, (d) PDA,

(e) PDA/TiO_2, and (f) PDA/TiO_2/PtNW, showing the changing trend of RMS roughness. Credit: SIAT

With rapid development of smart flexible electronics in wearable and implantable fields, it is urgent to prepare biomimetic electrode materials with simple operation, good biocompatibility and low cost, to obtain better stimulation/recording performance.

Traditional flexible electronic devices have disadvantages of low adhesion, easy delamination and failure in the fabrication process.

Although the polymerization process will be prolonged, the dopamine (DA) and its derivatives are promising for the fabrication of functional films and devices with excellent conductivity, bioadhesion and long-term stability.

Based on their previous work on neural interfaces (Electrochia Acta, Advanced Materials Interfaces), Prof. Wu Tianzhun's group from the Shenzhen Institutes of Advanced Technology (SIAT) of the Chinese Academy of Sciences proposed an accelerated deposition process using ultraviolet (UV) irradiation with the existence of nanotitanium dioxide (nano-TiO_2) to realize a rapid and stable synthesis of polydopamine (PDA) films.

The researchers also proposed in situ deposition process of nanostructured coatings such as platinum nanowire (PtNW) on PDA adhesive layer for better electrical performance.

This method reduced the time of PDA polymerization process to less than 1 h. It also increased the platinum (Pt) chelating rate with PDA (