Researchers develop bendable energy storage materials

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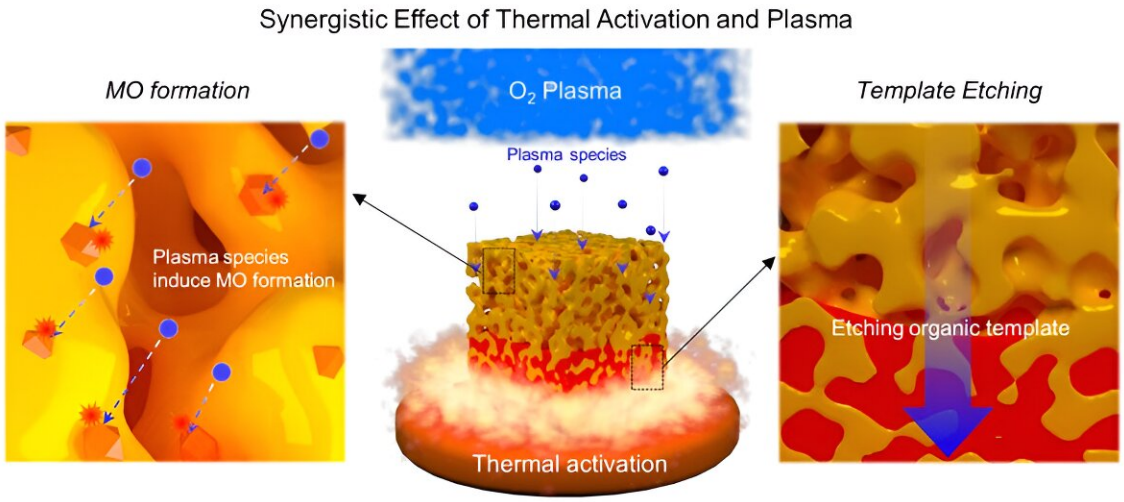


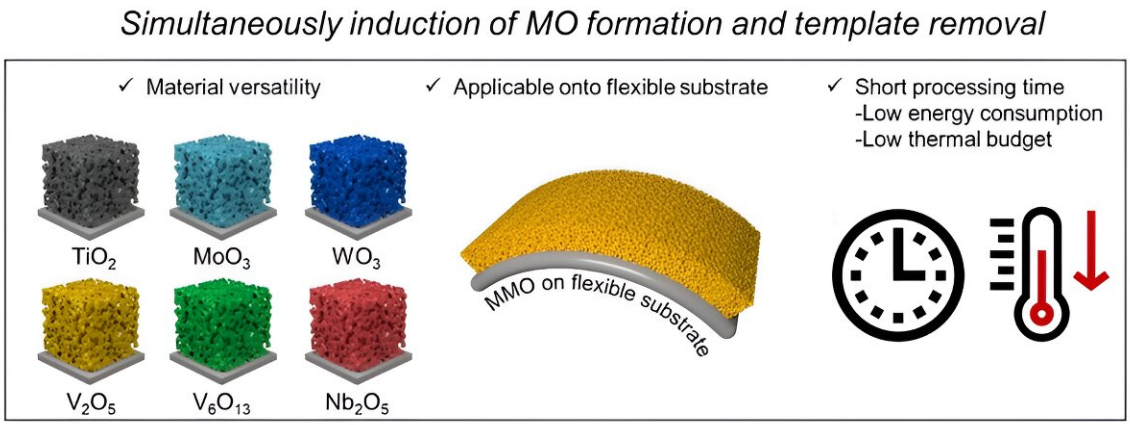
Synergistic effect of thermal activation and plasma. Credit: POSTECH

Imagine being able to wear your smartphone on your wrist, not as a watch, but literally as a flexible band that surrounds around your arm. How about clothes that charge your gadgets just by wearing them?

Recently, a collaborative team led by Professor Jin Kon Kim and others has brought a step closer to making this realty. This research work was published in *Advanced Materials*.

Mesoporous metal oxides (MMOs) are characterized by pores ranging

from 2 to 50 nanometers (nm) in size. Due to their extensive surface area, MMOs have various applications, such as high-performance energy storage and efficient catalysis, semiconductors, and sensors. However, the integration of MMOs on wearable and flexible devices remains a great challenge, because plastic substrates could not maintain their integrity at elevated temperatures (350°C or above) where MMOs could be synthesized.



Simultaneously induction of metal oxides formation and template removal. Credit: POSTECH

The research team tackled this problem by using synergetic effect of heat and plasma to synthesize various MMOs including vanadium oxide (V_2O_5), renowned high-performance energy storage materials, V_6O_{13}, TiO_2, Nb_2O_5, and WO_3, on flexible materials at much lower temperatures (150 ~ 200°C). The high reactive plasma chemical moieties provide enough energy that could be compensated by high temperature. The fabricated devices could be bent thousands of times without losing the energy storage performance.

Professor Jin Kon Kim said, "We're on the brink of a revolution in wearable tech. Our breakthrough could lead to gadgets that are not only more flexible but also much more adaptable to our daily needs."

More information: Keon-Woo Kim et al, Low-Temperature, Universal Synthetic Route for Mesoporous Metal Oxides by Exploiting Synergistic Effect of Thermal Activation and Plasma, *Advanced Materials* (2024). DOI: 10.1002/adma.202311809

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