Moisture-resistant hairstyling agent: Development of a humidity-induced shape memory polymeric material

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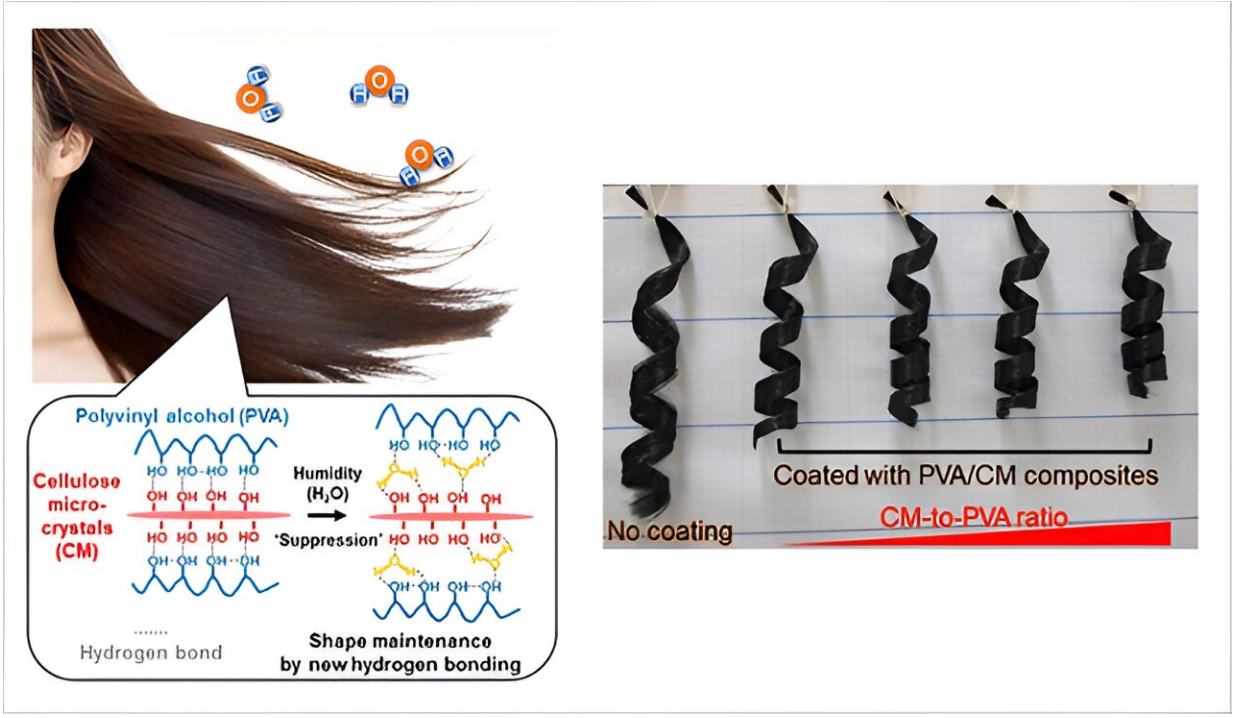

Mechanism of humidity responsiveness and styling performance in shape memory polymeric materials. Credit: *Advanced Materials Interfaces* (2023). DOI: 10.1002/admi.202300274

NIMS and Nihon L'Oréal K.K. have developed a shape memory polymeric material responsive to humidity. This innovative material,

when applied to a person's hair and allowed to dry, serves as an exceptionally moisture-resistant hairstyling agent. The research was published in *Advanced Materials Interfaces*.

Hairstyles play a crucial role in personalizing one's appearance and showing self-confidence. Demand for effective and functional hairstyling products has been growing. Weather-related humidity and sweat from exertion have long been a problem for hairstyle stability. Most currently available hairstyling products (e.g., hair sprays and gels) merely create a physical barrier on the hair's surface, offering limited protection against humidity. There is a considerable expectation for the development of advanced, highly moisture-resistant hairstyling agents.

This research team recently developed a humidity-responsive shape memory polymeric composite designed as a moisture-resistant hairstyling agent. The material's moisture resistance stems from the hydrogen bonding between polyvinyl alcohol (PVA) and naturally occurring cellulose microcrystals (CMs), forming a robust PVA/CM network.

These hydrogen bonds maintain the structural integrity of the PVA and CM components even when exposed to water molecules. The team compared PVA/CM composite coated and uncoated bundles of curled hair and found that the uncoated bundles uncurled and stretched more extensively than coated ones after being subjected to 80% relative humidity for six hours.

The team also found that the composites' efficacy in maintaining the original curled hair shape improved with an increased ratio of CM-to-PVA. These findings indicated the material's effectiveness in preventing the uncurling and stretching of curled hair in high humidity conditions. The material can be easily washed off using warm water (42°C) or shampoo.

This research elucidates the humidity-induced shape memory mechanism exhibited by the PVA/CM composite and demonstrates its potential for use as a humidity-resistant hairstyling agent.

More information: Koichiro Uto et al, Humidity-Responsive Polyvinyl Alcohol/Microcrystalline Cellulose Composites with Shape Memory Features for Hair-Styling Applications, *Advanced Materials Interfaces* (2023). DOI: 10.1002/admi.202300274

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