New water soluble polymer for water resistant coatings

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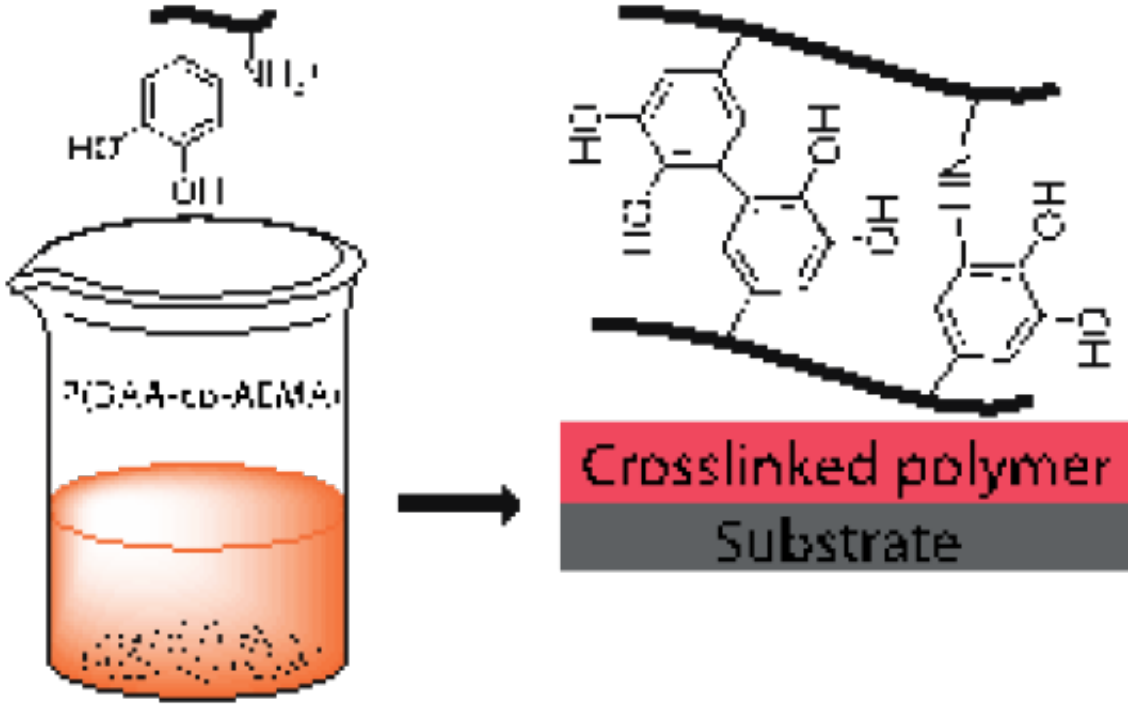
A new polymer on the basis of a trick used by mussels has been developed by the Wageningen PhD student Juan Yang. The polymer should be able to let water-based paint flow better and produce water resistant coatings. Yang will defend her PhD-thesis on 12 January at Wageningen University.

Water-based paint is better for humans and the environment compared to paint with chemical solvents. Paint based on water, however, still does not carry the same properties as those based on chemicals. The paint flows differently than traditional alkyd systems for example. Giving a water-based product water-repellent characteristics is also no sinecure.

Mussel

Yang therefore has been looking for a polymer that dissolves in water but creates water resistance after application in her PhD research. She was inspired by the mussel. Being under water, a mussel can still attach itself to surfaces. The mussel does so by first excreting a thread of a specific type of protein from its foot. A reaction then occurs in these proteins, whereby the thread losses the ability to dissolve in water within a minute and becomes strong and tough. Much research already has been done on the chemistry of these proteins because of the adhesion properties, but not so much on the insolubility in water. Yang is unravelling this characteristic in her dissertation Mussel-inspired chemistry and its applications.



A mussel-inspired copolymer forms P(DAA-co-AEMA) water resistant coating upon pH increase by self-crosslinking reaction of catechols and amines. Credit: Juan Yang et al, J. Mater. Chem. (2016)

Paint

The Wageningen PhD student was able to create a polymer with this property that reacts in water. One of the requirements for the toughening characteristic of this polymer is the de-acidification of its surroundings. This proof of principle offers a lead of departure for the paint industry to improve water based paints. The effects of the polymer on other paint components, such as pigment and other properties, needs further research.

The reactive polymer has the potency for application in other situations. For instance, mussel-inspired chemistry is suitable for the creation of antimicrobial coatings.

More information: Juan Yang et al. A clear coat from a water soluble precursor: a bioinspired paint concept, *J. Mater. Chem. A* (2016). DOI: 10.1039/C5TA09437B

Provided by Wageningen University