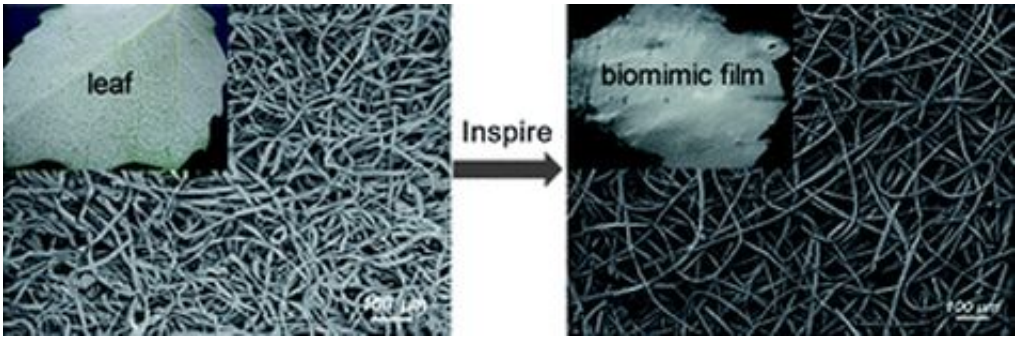
Science looks to poplar trees for 'cool roof' technology

March 21 2011, by Bob Yirka



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(PhysOrg.com) -- For as long as humans have been able to reason, they have mimicked nature in attempts to derive benefits for themselves; and just because we've become ultra-high tech in many ways, it doesn't mean we've stopped looking to nature to help us solve some of the problems that continue to arise in our paths. As one example Yanlin Song and others on a team doing research for the Chinese Academy of Science, as described in their paper "Highly reflective superhydrophobic white coating inspired by poplar leaf hairs toward an effective 'cool roof'" in *Energy & Environmental Science*, are copying the way poplar trees protect themselves from harsh sunlight and believe it might lead to new ways to help control the heat that is produced when sunlight beats down on a roof.

The idea is simple, the poplar tree, over eons, has developed micro-fibers on the undersides of its leaves that can reflect both light and heat from the sun; thus, when the sun shines directly on the tree, it turns its leaves upside down to protect the insides of the leaves from extreme heat and the ensuing loss of moisture.

The Chinese team has been working on spinning polymers into long protective hollow fiber coatings that could in theory reflect sunlight, and thus reduce the amount of heat that is absorbed when sunlight shines on a roof. To test their results, they covered a swath of material with diarylethene, a compound that changes color when heated, then covered that with their polymer film, and then let the sun shine. They found that the more closely they could emulate the structure of the natural fibers on the poplar leaves, the less the diarylethene changed color.

And while the results the team has managed to show so far are promising, there is still a pretty serious obstacle standing in the way of developing a commercial product that could help homeowners or businesses cut their summer cooling costs; the polymers are just not resistant enough to stand up to the constant barrage of heat, cold, wind and other weather conditions.

Song says he and his team will continue to work with the polymers to see if they can come up with something stronger but will also continue with what they've developed thus far, perhaps even branching out in to other areas, such as lighting applications or in developing waterproofing substances since their polymer film turned out to be water resistant as well.

More information: Highly reflective superhydrophobic white coating inspired by poplar leaf hairs toward an effective "cool roof", Changqing Ye, Mingzhu Li, Junping Hu, Qunfeng Cheng, Lei Jiang and Yanlin Song, *Energy Environ. Sci.*, 2011, Advance Article.

DOI:10.1039/C0EE00686F