Researchers develop “net” nanodetector

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Bin Ding and his team of researchers at Donghua University, Shanghai, China, have developed a new method of testing for formaldehyde using an electro-spinning netting technique. The process, described in their paper published in the journal *Royal Society of Chemistry* (RSC) involves spinning a membrane onto a quartz crystal resulting in a net that can be used to detect formaldehyde.

Because formaldehyde is used in so many manufacturing applications, both as a means to process polymers, and as a intermediate in making many kinds of cleaning agents, (as well as a process ingredient in making many medicines) a means for measuring its concentration is needed to assure safe working conditions for those involved in the manufacture of such products. Formaldehyde is considered to be a carcinogen at levels of 60-80 ppb over a half hours time, unfortunately, current methods for measuring formaldehyde levels require long time periods to get results, are not considered sensitive enough and generally cost a lot of money to make; constraints that have likely at times, put people at risk.

Now, Ding and his team have figured out a way to make a formaldehyde detector that returns results almost immediately, is far more sensitive than current methods, and can be produced relatively inexpensively. The process works by applying a polyamide (a polymer joined by peptide bonds) membrane onto a quartz crystal microbalance (a device used to measure the mass per unit area of a quartz crystal) using a special spinning technique. The result is a web coating that is able to trap formaldehyde particles making their detection relatively easy.

The web is able to trap formaldehyde particles because of the very small size of the web mesh (nanofibers); in the study, typical sizes were 100-500nm, but the team was able to get some down to as small as 20nm.

Such technology should be adaptable, the team writes, suggesting that such nets might be made for use in very fine filters to trap all manner of airborne hazards, including microorganisms. The team plans to next turn their attention to better understanding how the webs form the way they do to see how other such other sensors or filters might actually be created.

More information: "Polyamide 6 composite nano-fiber/net functionalized by polyethyleneimine on quartz crystal microbalance for highly sensitive formaldehyde sensors," *J. Mater. Chem.*, 2011, Advance Article. DOI: 10.1039/C1JM11847A