Advanced explosives detector to sniff out previously undetectable amounts of TNT

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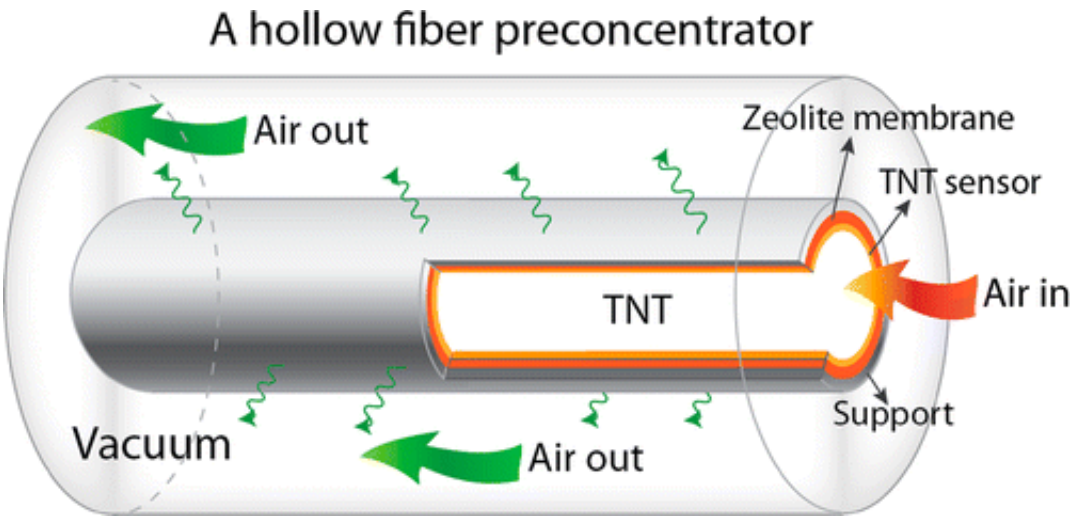

With the best explosive detectors often unable to sniff out the tiny amounts of TNT released from terrorist bombs in airports and other public places, scientists are reporting a potential solution. Their research in ACS' journal *Analytical Chemistry* describes development of a device that concentrates TNT vapors in the air so that they become more detectable.

Yushan Yan and colleagues point out that TNT and other conventional explosives are the mainstays of terrorist bombs and the anti-personnel mines that kill or injure more than 15,000 people annually in war-torn

countries. In large, open-air environments, such as airports, train stations and minefields, concentrations of these explosives can be vanishingly small – a few parts of TNT, for instance, per trillion parts of air. That can make it impossible for conventional bomb and mine detectors to detect the explosives and save lives.

They describe development of a preconcentrator that increases the levels of TNT and related explosives by 1,000 times in less than one minute. The scientists made a "molecular sieve" membrane on the surface of holes about as big as a speck of dust. Molecules of explosives get trapped in these holes and concentrated enough that security agents could detect previously undetectable levels of explosives.

More information: "Highly Selective Zeolite Membranes as Explosive Preconcentrators", *Anal. Chem.*, 2012, 84 (15), pp 6303–6307. DOI: 10.1021/ac301359j

Abstract
Highly selective thin zeolite MFI membranes are synthesized on porous stainless steel and α-alumina supports using a seeded growth method. An ultraviolet (UV) light treatment is employed as a low temperature alternative to remove the organic structure-directing agent (SDA) to avoid membrane cracking. The feasibility of the use of the MFI membranes as an explosive preconcentrator is examined by measuring the permeation of nitrogen (N2, an air surrogate) and 1,3,5-trimethylbenzene (TMB) (a 2,4,6-trinitrotoluene (TNT) surrogate) in a mixture of N2 and TMB. High N2/TMB selectivity (>10 000) and reasonable N2 flux (13.5 mmol/m2·s) are observed. On the basis of the flux, a hollow fiber array based preconcentrator is proposed and estimated to provide 1000× concentration within about 1 min using a hollow fiber with a 50 μm internal radius. This high performance explosive preconcentrator may open a new venue for the detection of subppb or lower level of explosives simply in conjunction with

conventional explosives detectors.

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