

Supplementary Information

1. Materials:

SU-8 2010 photoresist and SU-8 Developer (1-methoxy-2-propanol acetate) were obtained from M/s MicroChem, MA, USA. Whatman no. 1 chromatography paper circles of 12.5 cm diameter were purchased from M/s Borosil, Mumbai, India. p-Nitrobenzylpyridine (PNBP), potassium perchlorate, potassium iodide, rhodamine B, rhodamine 6G and all solvents were purchased from M/s Sigma-Aldrich, New Delhi.

Sarin (GB, O-isopropyl methylphosphonofluoridate), Cyclosarin (GF, O-cyclohexylmethylphosphonofluoridate), VX (S-2-diisopropylaminoethyl methylphosphonothiolate), Sulfur Mustard (SM, bis(2-chloroethyl)sulfide), Nitrogen mustard (NM, tris(2-chloroethyl) amine), Oxygen Mustard (OM, bis(2-chloroethylthioethyl)ether) were prepared in small quantities in our laboratory as per the reported procedures and were more than 95% pure as per GC-MS analysis.¹

Caution: Chemical Warfare Agents are extremely toxic chemicals; they should be prepared and handled by trained professionals in an efficient fuming hood equipped with an alkali scrubber. Individuals handling them should wear a facemask, gloves, and a protective suit.

2. Preparation of Hydroxamate of Rhodamine 6G (R6GH):

R6GH was prepared from the rhodamine 6G by following the procedure reported by Yang et.al.²
¹H NMR (Bruker, 400 MHz, solvent CD₂Cl₂): 8.05-8.03 (m, 1H), 7.55-7.51 (m, 2H), 6.89-6.87 (m, 2H), 6.49 (s, 2H), 6.33 (s, 2H), 3.33 (s, 2H), 3.19-3.11 (m, 4H), 1.92 (s, 6H), 1.22-1.19 (t, 6H); ESI-MS: *m/z* 430 [(M+H)⁺]

3. ESI-MS Analysis:

Mass spectral analysis was performed with a LCQ Advantage ion trap spectrometer (Thermo-electron Corporation, San Jose, CA, USA) equipped with orthogonal electrospray interface. The system was operated in positive ion mode. The ESI source parameters were as follows: Spray voltage, 4.5 KV, capillary voltage, 4 V; tube lens offset, 40.00 V; sheath gas, 25 arbitrary unit of pressure. Helium was continually flowing into the collision cell at 0.1Pa (10–3Torr) during the ESI-MS operation. ESI-MS data were acquired over the mass range m/z 50–700.

4. Fabrication of μ -PADs:

Patterning of the paper was carried out according to previously reported methods.^{3, 4} Briefly, a 12.5-cm-diameter piece of chromatography paper was soaked in 2mL of SU-8 2010 photoresist for 1 min., followed by spinning at 2000 rpm for 30s and baking at 95 °C for 5min. The paper was then covered with a transparency film having desired pattern and exposed to UV radiation for 10 s. After exposure, the paper was again baked at 95 °C for 5 min to cross-link the exposed portions of the resist. The non-polymerized photoresist was removed by soaking the paper in SU-8 Developer (1-methoxy-2-propanol acetate) for 5min followed by rinsing with isopropanol. Finally, the paper was dried at room temperature for one hour.

After complete drying, the test zones of the μ -PADs were spotted with the required reagents. For mustards, an acetonitrile solution of 50 mM PNBP and 10mM of potassium perchlorate was prepared and 0.3 μ l of it was spotted on the test zone. For control, 0.3 μ l of 10mM potassium perchlorate solution was spotted. Similarly for nerve agents, 0.3 μ l each of 50mM R6GH and 5 mM of potassium iodide were spotted. The control zone for nerve agents

was spotted with the same amount of potassium iodide only. After spotting, the μ -PADs were completely dried in flowing nitrogen, sealed in individual polybags and were stored at room temperature until used.

5. Semi-Quantitative Estimation:

Semi-quantitative estimation of the analytes was carried out as per the method reported by Martinez et. al.⁵ Briefly, the developed μ -PADs were converted into coloured JPG image with the help of a desktop scanner (HP make, model G4010). The image was then opened into Adobe Photoshop software (version 7.0) and converted into 8 bit CMYK color mode. For color intensity, whole test zones were selected with the help of marquee tool (elliptical or rectangular, depending upon the shape of test zone) and mean intensity was measured in cyan channel. Thus obtained value was then plotted against the analyte concentration.

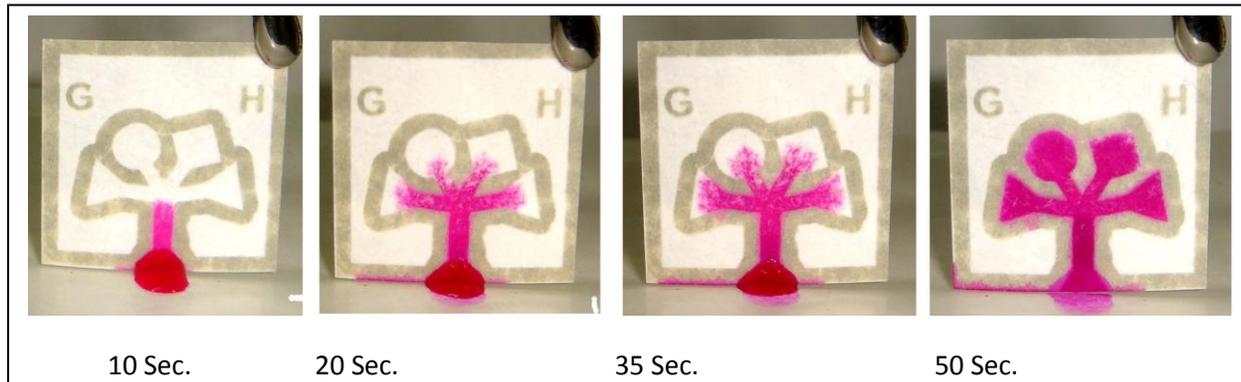


Figure S1: Showing that the movement of an aqueous solution of rhodamine dye, confined to the desired micro channels

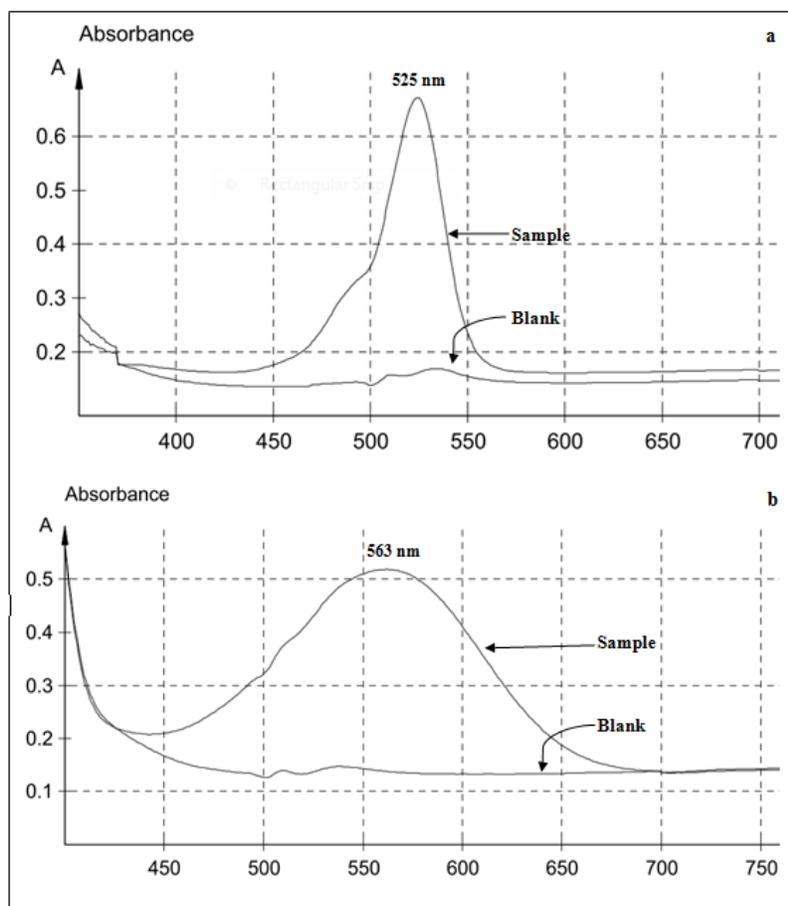
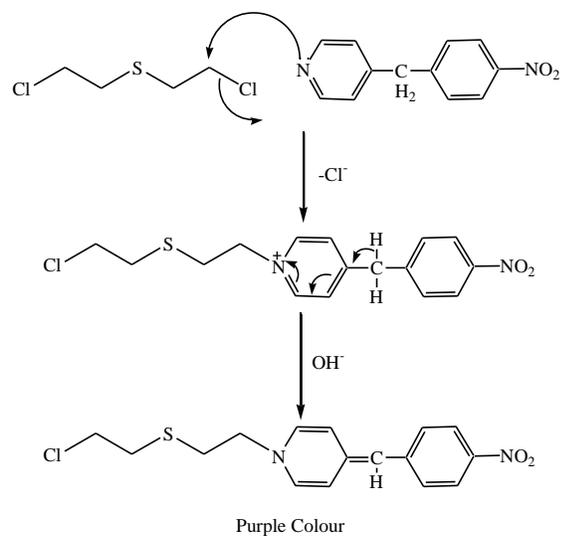


Figure S2: UV-Vis absorbance spectra of a) 50 mM DMF solution of R6GH treated with 10 mM sarin (GB) and b) 50 mM DMF solution of PNBP treated with 10 mM sulfur mustard (SM)



Scheme S1: Colorimetric reaction of PNBP with SM, producing purple colour in alkaline medium

References:

1. J. Ledgard, *A Laboratory History of Chemical Warfare Agents*, USA. ISBN 978-0-6151-3645-5.
2. Y. K. Yang, H. J. Cho, J. Lee, I. Shin and J. Tae, *Org. Lett.*, 2009, **11**, 859.
3. A. W. Martinez, S. T. Phillips, M. J. Butte and G. M. Whitesides, *Angew. Chem. Int. Ed.*, 2007, **46**, 1318.
4. W. Dungchai, O. Chailapakul and C. S. Henry, *Anal. Chim. Acta*, 2010, **674**, 227.
5. A. W. Martinez, S. T. Phillips, E. Carrilho, S. W. Thomas, H. Sindi and G. M. Whitesides, *Anal. Chem.*, 2008, **80**, 3699