

**NANO-INDIS  
TOXIC  
CHEMICAL  
INDICATORS**

# EXAMPLES OF CHEMICAL DETECTORS



Ethylene Oxide



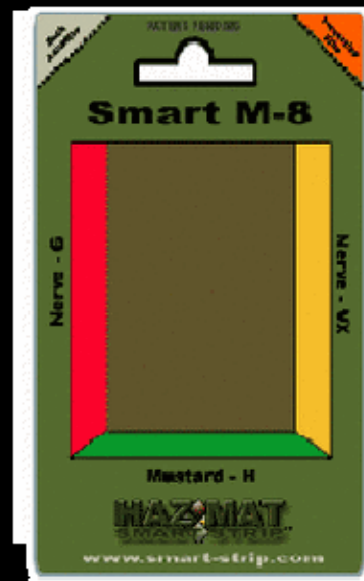
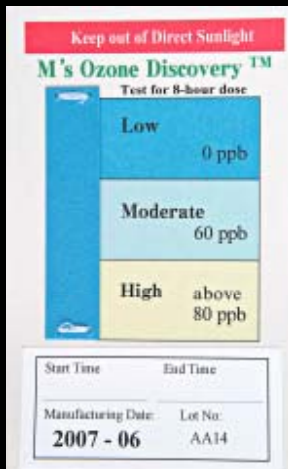
Formaldehyde



HazMat smart-strip



CDS/HazMat Kit



M8 detection



M256A1 Chemical Agent Detector Kit

**ACCORDING TO A TASK FORCE, CHLORINE AND ETO  
(ETHYLENE OXIDE) ARE CONSIDERED “EXTREME RISK  
CHEMICALS” AS THEY ARE WIDELY USED**

**International Task Force 40:  
Toxic Industrial Chemicals (TICs) -  
Operational and Medical Concerns**

US/UK/CA Memorandum of Understanding on the Research, Development  
and Acquisition of Chemical, Biological and Radiological Defense Materiel



US Position Meeting  
John J. Resta  
16 Aug 01

# RISK ASSESSMENT

Chemical	Physical state	Global production	Probability			Hazard				Risk	ITF-25	
			History Score	Probability	Health	Flammability	Instability Score	Hazard				
Ammonia	4	4	4	12	frequent	3	1	0	7	marginal	high	high
Carbon monoxide	4	3	0	7	likely	3	4	0	10	critical	high	medium
Chlorine	4	4	4	12	frequent	4	0	0	8	critical	extreme	high
Ethylene oxide	4	4	2	10	frequent	3	4	3	13	catastrophic	extreme	high
Freon-12	4	1	0	5	occasional	1	0	0	2	negligible	low	NR
Methanol	2	4	0	6	occasional	1	3	0	5	marginal	moderate	NR
Parathion	0	2	4	6	occasional	4	0	0	8	critical	high	low
Phosgene	4	3	4	11	frequent	4	0	1	9	critical	extreme	high
Propane	4	4	4	12	frequent	1	4	0	6	marginal	high	NR
Silica, amorphous	0	2	0	2	seldom	0	0	0	0	negligible	low	NR
Sulfuric Acid	0	4	2	6	occasional	3	2	0	8	critical	high	high

Hazard	Probability				
	<i>Frequent</i>	<i>Likely</i>	<i>Occasional</i>	<i>Seldom</i>	<i>Unlikely</i>
<i>Catastrophic</i>	Extremely High	Extremely High	High	High	Moderate
<i>Critical</i>	Extremely High	High	High	Moderate	Low
<i>Marginal</i>	High	Moderate	Moderate	Low	Low
<i>Negligible</i>	Moderate	Low	Low	Low	Low

Risk Estimate

**A COUPLE OF EXAMPLES  
OF NANO INDIS FOR  
MONITORING  
(VISUAL/SELF-READING)  
TOTAL EXPOSURE TO  
HAZARDOUS CHEMICALS**

# UNCOATED METALLIZED/ALUMINIZED PLASTIC FILM EXPOSED TO CHLORINE

Click on image below for video



09 Feb 10 11:37:09.540

↑ Time (minutes)

# A PRECURSOR COATED METALLIZED PLASTIC FILM EXPOSED TO ETO

Click on image below for video

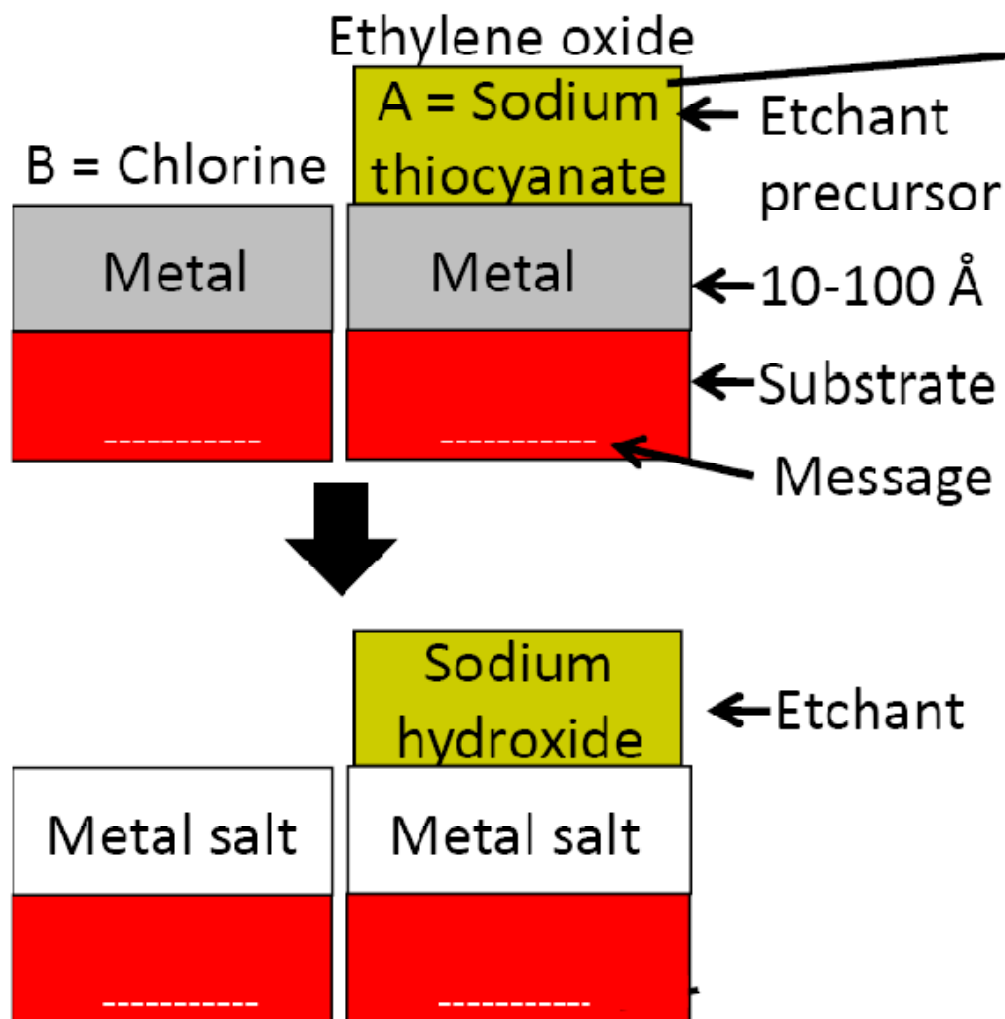


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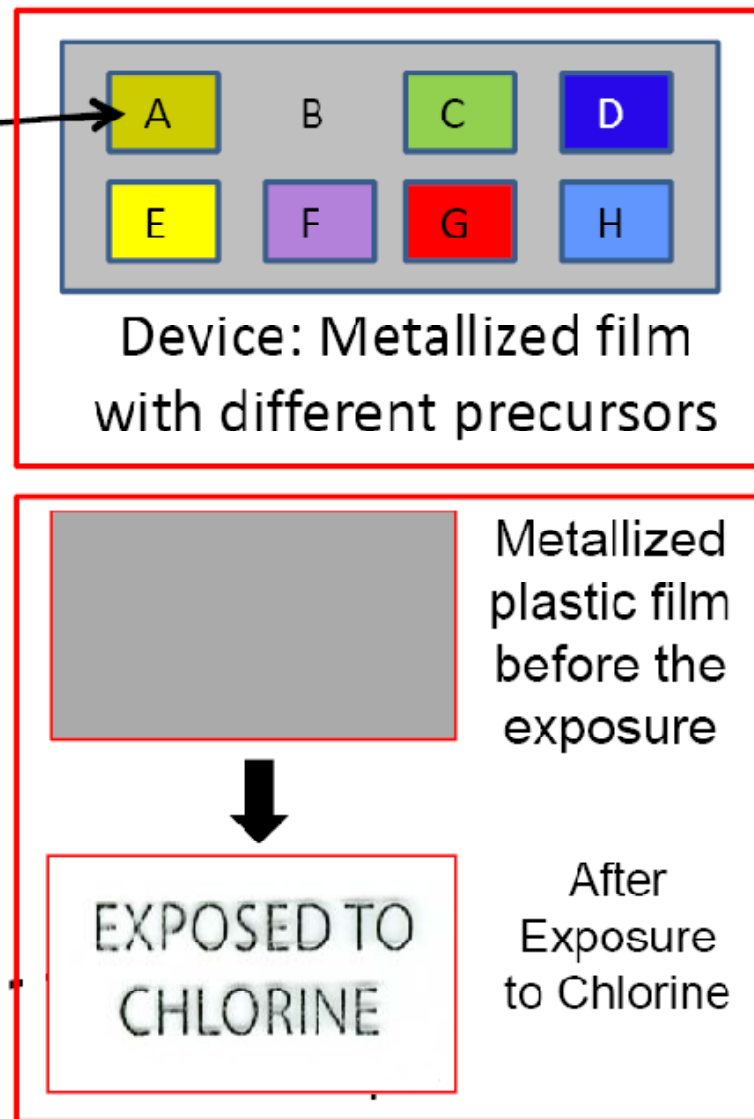
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# A SCHEMATIC PRESENTATION OF A NANO-INDI FOR MONITORING CHEMICAL AGENTS SIMULTANEOUSLY

## CROSS SECTIONAL VIEW



## TOP VIEW



Humidity and other chemical Nano-Indis can be used for monitoring the service life the carbon cartridges

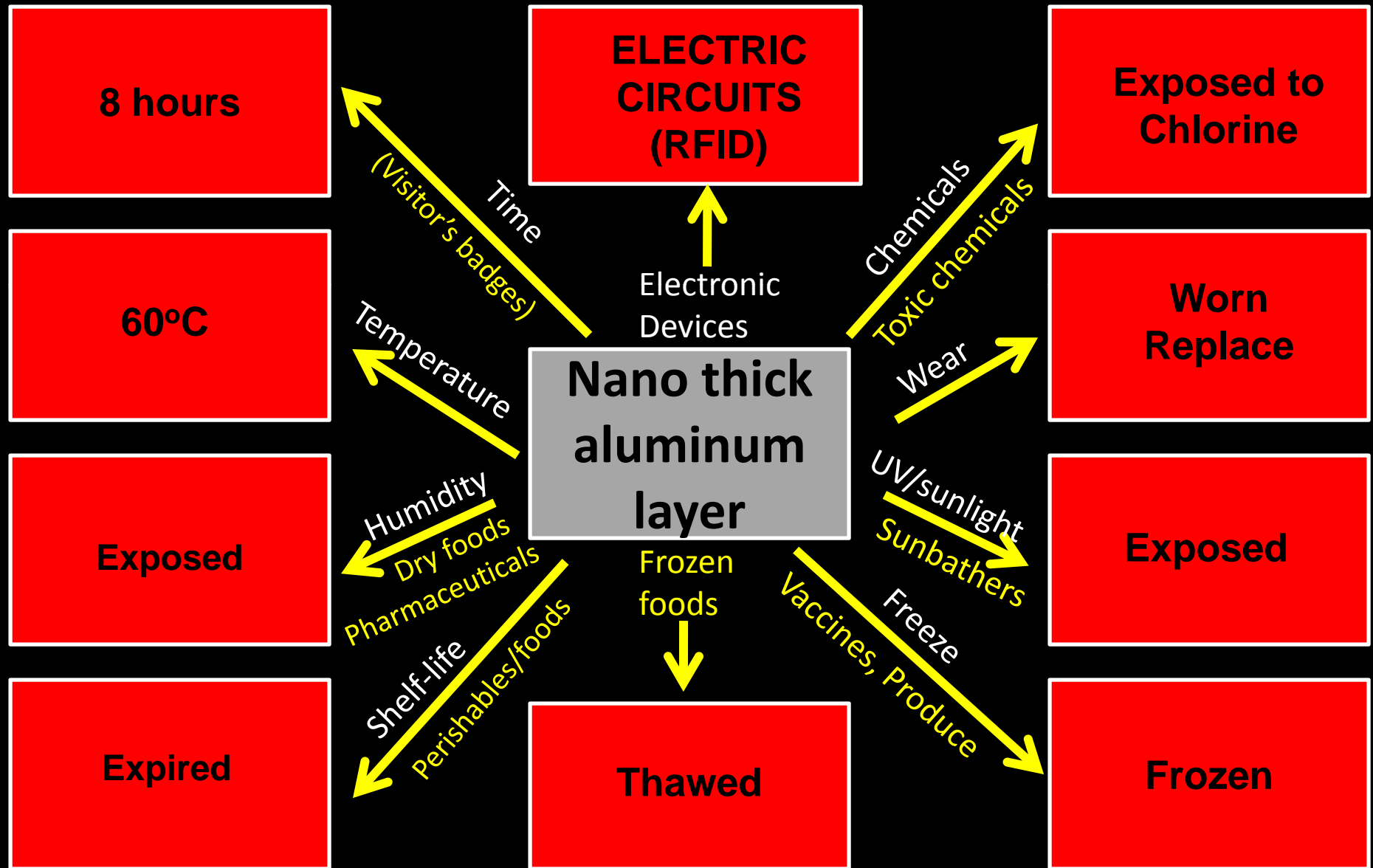


## **WARNING TYPE NANO-INDICATORS**

- The following slides summarize some of the warning type of nano-indicators we have developed using a metallized plastic film

# EXAMPLES OF WARNING TYPE NANO- INDIS

(Different activators/precursors are used for different indicators)



# **NANO-INDIS™**

**A REVOLUTION IN  
INDICATOR TECHNOLOGY**

**A SELECTIVE INDICATOR  
TECHNOLOGY WITH ESSENTIALLY  
NO FALSE SIGNALS**

# NANO-CONVERSION TECHNOLOGY

AN IGNORED BUT NOVEL AND  
UNIQUE FIELD OF NANOSCIENCE

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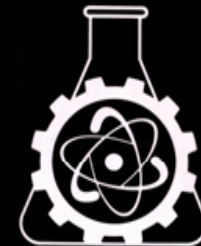
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