



## Adsorbents for CO, HCN, Sulfides, Other Simulants and Agents in Air

### Benefits

- Compatible with gas/vapor phase & condensed phase removal of contaminants for HCN
- Low catalyst cost: \$1-\$10/lb
- 2.5 wt% CO
- 15 wt% HCN
- 12 wt% H<sub>2</sub>S
- Ct values of >6.0 million for DMMP and >400,000 mg•min/m<sup>3</sup>
- Regenerability in air
- Increased lifetime of face-mask cartridges

### Applications Include Adsorption of:

- CO
- HCN and other cyanides
- Organophosphates
- Amines
- Ethylene
- Hydrogen sulfide
- Mercury
- Nitrogen/Oxides
- Oxygen

Eltron Research & Development Inc. has developed adsorbents for a number of applications, including chemical warfare agent removal, gas clean-up, liquid fuels desulfurization, deodorization, and other separation and purification problems. There is increased interest in these areas, driven by chemical defense, homeland security and energy concerns. Adsorption of CO, HCN, ethylene, organosulfides, organophosphonates and mercury have been demonstrated. Performance of adsorbents has been found in some applications (e.g., for HCN and chemical warfare agents) to greatly exceed that of commercially available materials, while for other species (e.g. CO), we believe that performance is state-of-the-art.

### Gas Clean-Up

The materials have demonstrated capabilities useful for employment in the warm gas (i.e., 250-400°C) clean-up of process (e.g., syngas) and flue gases. For example, selected materials have shown the ability to remove mercury from simulated flue gases. Application in the removal of cyanides, H<sub>2</sub>S and organosulfides is anticipated to be implemented successfully.

### NO<sub>x</sub> Trap Catalytic Adsorbents

Selected materials have been shown by Eltron to demonstrate exceptional performance in the capture of nitrogen oxides. The materials have shown greater than 90% removal of NO + NO<sub>2</sub> at 300°C and 300ppm NO<sub>x</sub>.

### Liquid Fuels Desulfurization

Eltron adsorbent materials have been developed primarily for gas/vapor phase removal of contaminants. However, results obtained (e.g., in reactive topical skin protectants) indicated that removal of organic sulfides in the condensed phase appears promising.

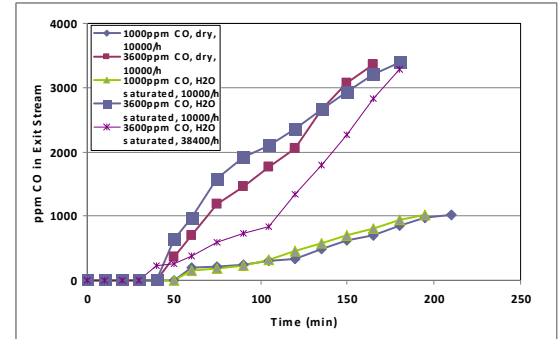


Figure 1. Plots of CO in exit stream of CO/air mixture. T = 23°C. Results obtained at 38,400 h<sup>-1</sup> suggest weight capacity of CO of ≥8.5%.

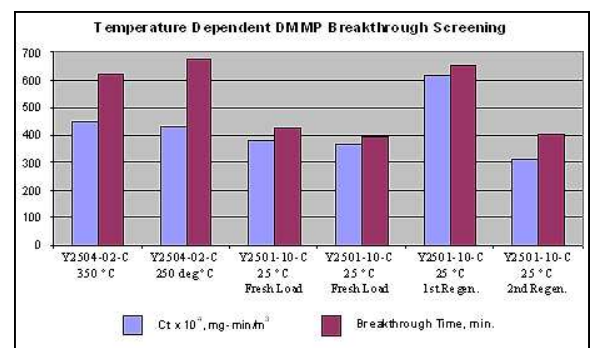


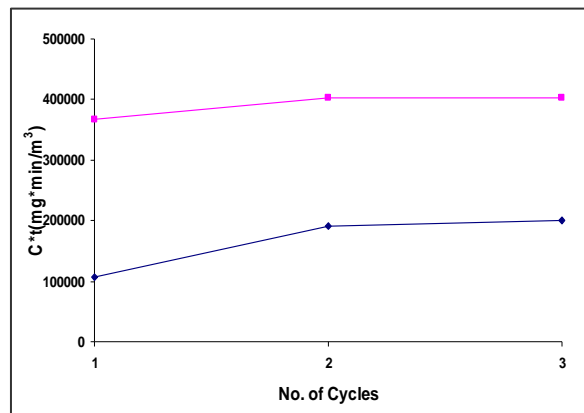
Figure 2: Plots of Ct and breakthrough time for PMMP in air. GHSV=16,000 h<sup>-1</sup>. 0.2g of material used for each experiment.

### Oxygen Purification

Eltron has recently developed adsorbents for the catch-and-release (CAR) separation of air and purification of oxygen.

### Destruction/Removal of Chemical Agents

Eltron has developed regenerable catalytic adsorbent materials that have been shown to remove a number of simulants and agents from air. In particular, essentially complete removal of nerve agent stimulant (e.g., DMMP) and HCN have been demonstrated at ambient temperature and of half-mustard (chloroethylethyl sulfide or CEES) at 350°C. The Ct values obtained at breakthrough are higher than any existing adsorbents: >6.0 million for DMMP and >400,000 mg•min/m<sup>3</sup>. The Ct demonstrated towards CEES was 12 million at 350°C. The greatly increased breakthrough times and regenerability, especially for HCN, promise to increase lifetime of face-mask cartridges.



HCN removal at 25°C over metal oxide sorbents.

### Stage of Development

Eltron Research & Development currently has a prototype reactor. Eltron also has related patents and patent applications filed with the USPTO for this technology.

- 12/257,811 *A Metal Oxide System for Adsorbent Applications*
- 6,458,741 *Catalysts for Low-Temperature Destruction of Volatile Organic Compounds in Air*
- 6,787,118 *Selective Removal of Carbon Monoxide*
- 7,329,359 *Application of Catalysts for Destruction of Organic Compounds in Liquid Media*

### Contact Us

To discuss the possibility of entering into a business relationship with Eltron, contact the Business Development Group at [business@eltronresearch.com](mailto:business@eltronresearch.com).

To learn more about Eltron Research & Development and the many other technologies that the company is researching and commercializing, visit [www.eltronresearch.com](http://www.eltronresearch.com).



### Eltron Research & Development Inc.

Eltron Research & Development Inc. commercializes novel technologies involving advanced materials, energy, water and environmental systems.

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