

Respiratory Protection From CO Inhalation

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Each year, first responders are called to deal with approximately 1.4 million fire incidents. Fires produce significant quantities of hazardous compounds including carbon monoxide (CO), a colorless, odorless poisonous gas that is the product of incomplete combustion of organic materials. Due to the large number of CO exposure incidents during fire fighting activities there is an opportunity to positively impact first responders' health with a CO oxidizing respirator. While most fire fighters employ a mask to help make the air more tolerable to breathe; below the level of the full-face SCBA systems, there is no suitable respirator available to protect fire fighters from exposure to CO.

With funding from the US National Institute of Occupational Safety and Health (NIOSH), TDA has developed, and scaled up, an affordable, low gold content CO oxidation catalyst that converts nearly all of the CO found in the air around fires to CO₂. The catalyst functions well from 0°C to the temperature limit of human inhalation. We incorporated our proprietary catalyst into the escape hood (CBRN) respirator and a wild land firefighter respirator and successfully tested the catalyst (as per NFPA's proposed 1984 standards) requirements. We have scaled up the catalyst formulation and have the capability to manufacture up to 5 kg. of catalyst per day. Our catalyst typically incorporates 0.05 to 0.3% Au on various metal oxides making it affordable for use in a respirator and performs on par with catalysts that contain significantly higher Au content (about 1%).

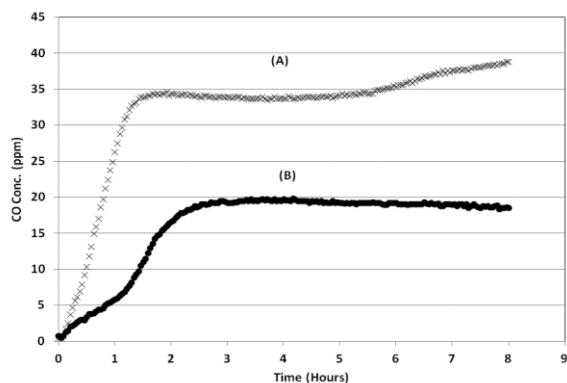


Figure 1. CO concentration in breathing air downstream of two catalysts with varying Au contents A) 0.075 wt.% Au, B) 0.1 wt.% Au . Test conditions: NFPA 1984 (25°C)

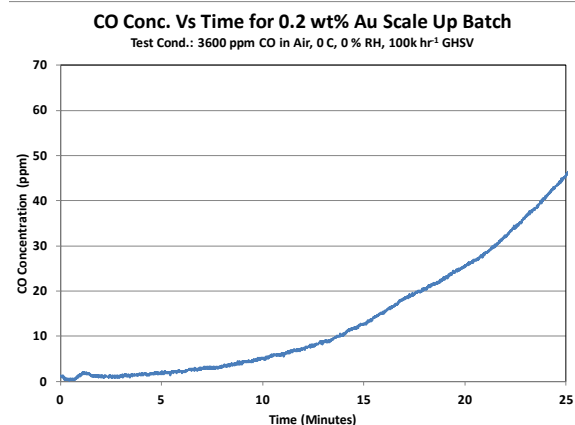


Figure 2. Results from a 2 kg batch produced late in the Phase II project that are representative of the performance of multi kilogram batches of TDA's CO oxidation catalyst. Particle size is +20/-40 mesh.