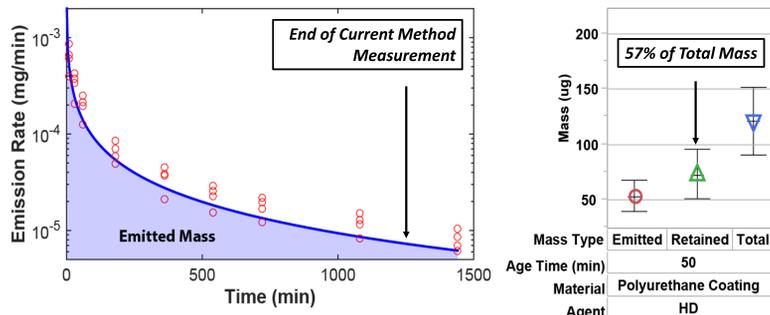


Shawn Stevenson,<sup>1</sup> Brent Mantooth,<sup>1</sup> Janlyn Eikenberg,<sup>2</sup> Stefanie Quinones,<sup>2</sup> Michelle Sheahy<sup>2</sup>

<sup>1</sup>Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD, <sup>2</sup>Leidos, P.O. Box 68, Gunpowder, MD

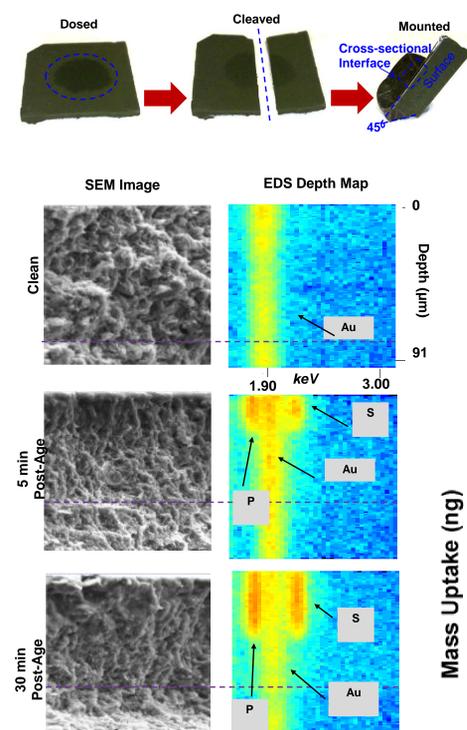
## Background

- A coating technology must adhere to many critical specifications that encompass **agent resistance**, camouflage, and corrosion resistance.

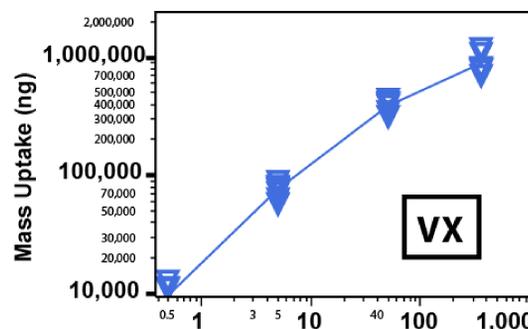


- Current methods to evaluate the agent resistance of a coating measured the agent off-gassing after an isopropanol (IPA) rinse to determine the coating's resistivity to agent.
- Vapor test does not fully measure all the agent that would re-emit and produce hazards to unprotected personnel.

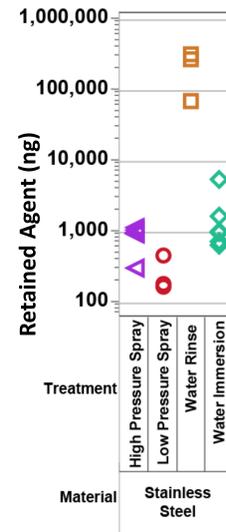
## Absorption Dynamics



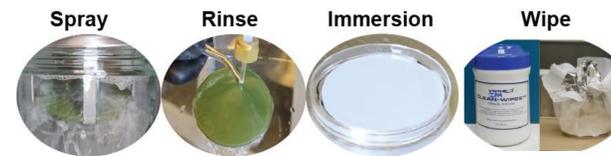
- Absorbed agent can re-emit as vapor or contact hazards to unprotected personnel.
- Techniques such as SEM-EDS can track the penetration of agent into a coating, which results in absorbed agent. The amount of absorbed agent can increase over time.
- The new method will account for the total absorbed agent mass found in a material.



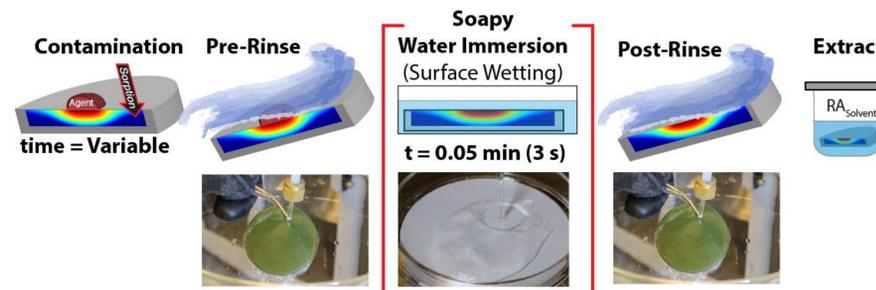
## Measurement of Absorbed Agent



- The new Chemical Agent Resistance Method defines agent resistivity in the terms of a coating that does not retain agent after a mild surface treatment process.
- Wipes, sprays, rinses, and immersions were evaluated for surface agent removal ability.
- Sprayers are not providing better agent removal across materials than 'simple' low flow treatments
- Sprayers require extra hardware and more variables to control than simple low flow treatments
- Indication of immersion as preferred treatment.



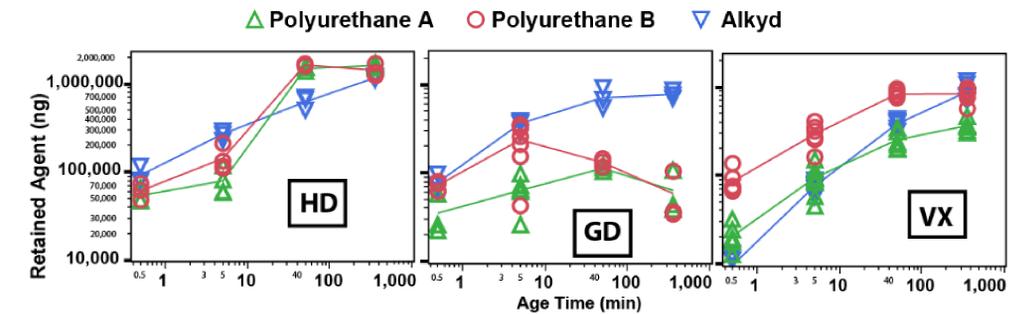
- Immersion step will use soapy water to emulate typical CONOPS for pre-decontamination procedures.
- Agent retention is a dynamic process; the longer agent resides on a material, the more agent may be retained.
- Analysis of the agent retention as a function of time will indicate the agent resistance of the coating.



## Conclusions

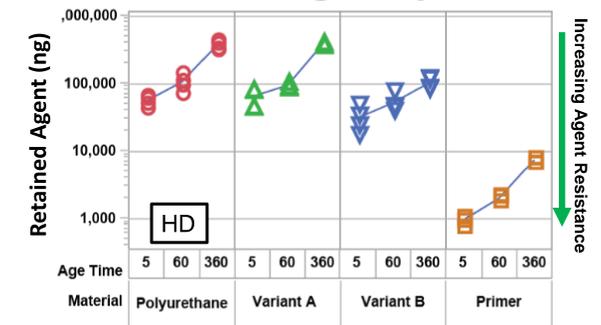
- Agent resistance is a function of chemical composition and material morphology, which leads to variations in retention and resulting exposure
- The new agent resistance method provides the total quantitation of agent that may be re-emitted and pose a hazard to unprotected personnel, a benchmark measurement of the quantitative resistance value over time, and the consequence of waiting operationally relevant times to remove agent.
- Method is currently being verified with a multi-laboratory repeatability and reproducibility study (ISO 5725).
- Working with ARL to implement the new chemical agent resistance method into MIL-DTL specifications.

## Retention is Agent-Material Specific



- The new method was applied to multiple coatings to illustrate differences in agent retention across materials.
- Results demonstrate different magnitudes and rates of agent retention

## A Tool for Coating Improvements



- Evaluation of the coating variants with the new chemical agent resistance method not only showcases the range of the method, but also provides insight into paint properties that increase agent resistance
- The method indicates coating variants such as gloss, flattening agents, and resins that alter agent resistance.
- Some variations did not alter agent resistance, while others resulted in 100x better resistance.

## Acknowledgments:

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