

THREAT AGENT DEFEAT MODELING AND TESTING

Materials Science In Extreme Environments University Research Alliance

Andrew Proulx Johns Hopkins University **Tim Weihs** Johns Hopkins University

The Materials Science in Extreme Environments University Research Alliance (MSEE URA) is DTRA's largest countering weapons of mass destruction basic research program. The MSEE URA is led by Johns Hopkins University and includes 16 academic, industry, and DoD/national laboratory partners across the United States.

The MSEE URA's basic research mission is focused on the defeat of chemical and biological agents, and the defense against nuclear blast. To accomplish this mission, the Alliance's goals are:

Advance the fundamental understanding of materials and chemistries under extreme pressure, temperature, and radiation

Create state-of-the-art diagnostics tools, predictive models, and advanced materials and transition them

Manage and foster a collaborative research environment

Train, mentor, and inspire the next-generation workforce

The scale of the Alliance enables multiple investigators to collaborate and to integrate their research efforts versus the traditional single investigator approach.

In the area of agent defeat modeling and testing, the Alliance is focused on prompt thermal and chemical defeat of agents and simulants at both low and high temperatures. We seek to identify, understand, and control the relevant decomposition reactions and their kinetics. This goal leads to two scientific drivers: 1) identify products and reaction rate of agents and simulants at low/high temperatures and fast heating rates, and 2) understand and control reaction chemistry for various conditions of CWMD operation. The strategy for achieving these goals is a combinatorial approach including experimental and computational investigations of fundamental chemical reactions and kinetics in various extreme environments and conditions. We develop and use novel experimental techniques to analyze materials properties in these extreme conditions, along with new computational models and tools that we implement in parallel. In addition, we seek to translate new materials, novel techniques, and validated models to applied research groups in DOD and corporate settings.

A final alliance goal is workforce development. Our activities involve all academic levels including high-school students, undergraduates, graduate students, postdoctoral scholars, and young professors/investigators, and they include student internships at universities and DoD/national laboratories, workshops, professional development and short courses, and seminars. DTRA/DOD personnel participate in these activities which strengthens our collaborations.

The MSEE URA's research and workforce development activities provide an effective pipeline for future scientists and engineers to serve in academia, government, and industry.

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