REAEROSOLIZATION OF HAZARDOUS MATERIALS: WHAT GOES DOWN, CAN GO BACK UP AGAIN

Deposition Of Powders On Surfaces – And The Implications For Removal

Riley Newcastle DTRA

Carl Sagan suggested, “If you wish to make an apple pie from scratch, you must first invent the universe.” In many aspects, understanding powder behavior – including deposition, adhesion, removal – can feel similarly to those studying particulate contamination. The field is broad, affecting numerous applications. The work here focuses specifically on powder contamination in homeland security and defense settings. While target particles may appear different, similarities do exist, as described here. First, the work presented shows that the method in which researchers deposit contaminants significantly impacts post-deposit behavior in terms of size, morphology, and surface adhesivity. As scientists striving for repeatability, the most reproducible deposit often starts with contaminant dissolved in solution. This ideality is considered, alongside the effects of suspended and dry contaminant deposits. Results indicate solvents fundamentally change the adhesivity to the target surface, and dry deposits are highly susceptible to removal / re-aerosolization. Further, as scientists striving for repeatability, sometimes contaminant morphology is chosen for laboratory friendliness. The work presented shows that changing particle size / shape can render bulk powder or composite significantly different from the target bulk material – which impacts operational residue formation. This endeavor works backwards – inserting idealized materials back into bulk form and observing bulk behavior. Results show that choosing “ideal” particles (when target contaminants are not) can create repeatability but fundamentally alters bulk behavior – which impacts contamination encountered in operational environments. Lastly, the work presented considers outside factors – the influence of environment and operator on contaminant removal. Results indicate that these influences significantly impact residue behavior, though isolating individual factors remains difficult. Results from the compiled studies allow appreciation for the challenge breadth, while providing valuable lessons in contaminant behavior.

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