

Geochemical and Physical Characteristics of Iraqi Dust and Soil Samples

The goal was to describe the physical and chemical properties of Iraqi dust to analyze how this dust reacts with gun lubricants used in Iraq, and to develop recommendations for additional testing that would contribute to solving the gun-jamming problem for U.S. soldiers. This project was conducted because combat weapons (M4 and M16 rifles) were jamming and failing to fire dependably in Iraq. No specific causes were identified, but anecdotal information suggested that the problem was related to high levels of dust in the area combined with the properties of standard Army cleaner, lubricant, and preservative (CLP). We conducted this project at DRI and results were reported in 2004. We found that there were significant differences between the test conditions for those weapons in the US and in Iraq and that it was dust that was causing the weapons to jam.

Summary of Project Details: We quantified physical and chemical characteristics of dust derived from soils sampled in Iraq. The samples were collected *in situ* from soils that contribute to dust emission, from the interior and exterior of vehicles, and from oil and dust from jammed weapons. We also analyzed fresh gun lubricants. The samples were characterized for major physical, chemical and mineralogical constituents.

Management Implications: Our analyses of Iraqi dust showed the dust to be highly variable based on its origin and that it was significantly different from the quartz materials used for standard chamber dust tests of military equipment. We found that the high concentrations of reactive chemicals and high volumes of fine silt and clay materials were observed to react with chemicals found in gun lubricants. Of particular importance is that the character of the soils and dust collected from areas of military activity in Iraq were greatly different from the material used in current weapons testing procedures. In short, we were able to determine the cause of the failure of combat weapons. We recommended conducting further analyses of the chemical properties of Iraqi dust to evaluate potential for corrosion and related impacts to military equipment. Because soils and dust collected from areas of military activity in Iraq differed significantly from the material used in chamber-testing procedures for weapons and are unlike natural geologic materials to which weapons are exposed during most training environments in the U.S. we also recommended characterizing dust conditions worldwide for improving testing at analog sites in the US.

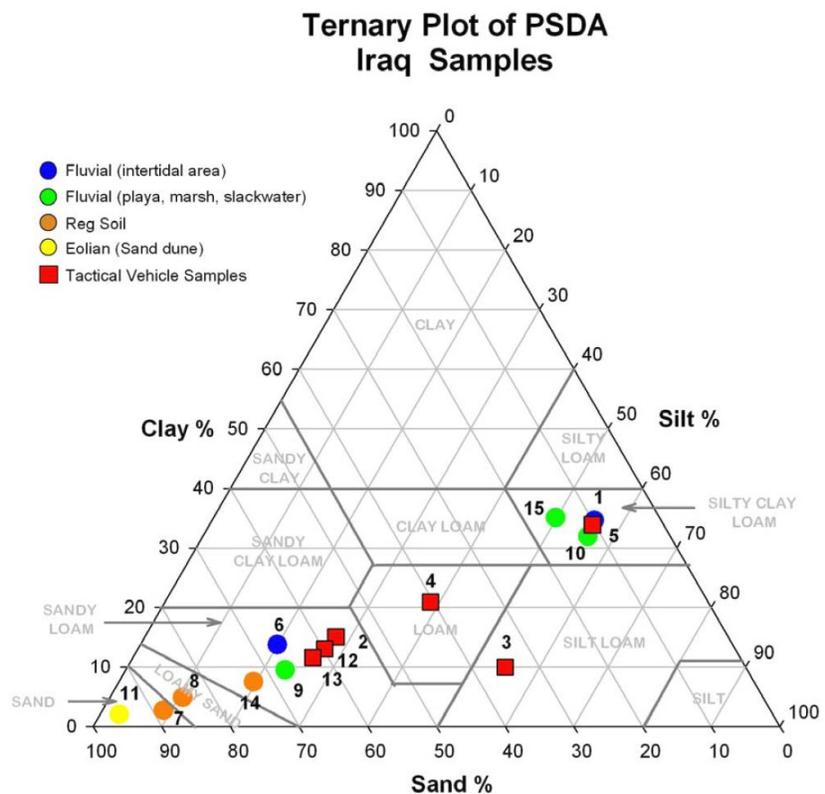


Figure 5. Distribution of the relative proportions of sand, silt, and clay for all 15 samples. Texture of the nine bulk samples largely reflects environmental settings. Numbers are sample ID numbers (see Table 1).