OBJECTIVE: To develop a means to produce an infrared obscurant in situ from a combat vehicle.

DESCRIPTION: The Army is considering reviving the Vehicle Engine Exhaust System (VEES), which vaporizes fuel (diesel, when VEES was first introduced in the 1980’s), by injecting it into the engine exhaust. The diesel recondensed immediately upon contact with ambient air, forming a dense white cloud. VEES did not work with JP8, and is also limited to primarily the VIS portion of the spectrum. Since that time, there has been a proliferation of sensors operating in the infrared. The objective of this topic is to develop an infrared obscurant that is produced in situ from the vehicle exhaust. It is suggested that the fuel be modified or have an additive which will react with the fuel upon extreme heating, or react upon exposure to air to produce the desired IR obscurant.

To address this requirement, the effort must identify the particles that will attenuate energy in the infrared portion of the electromagnetic spectrum. Generally speaking, higher performing particles are either flake or fiber shaped with high aspect ratio (approx. major dimension 3-5 um, minor dimension 10-50 nm) and high electrical conductive (on order of copper). Successful product will have an extinction coefficient of at least 1 m2/g covering the 3-5 um range and the 8-12 um range of the EM spectrum.

PHASE I: Outline then demonstrate the reaction chemistries necessary to produce an infrared obscurant using the on board vehicle exhaust of an existing combat vehicle. Demonstrate the infrared performance of the obscurant through modeling or chamber measurements. Effort may require a scaled system to demonstrate capability of producing IR obscurant through effluent stream. Continuous operation for at least 30 min without "gumming" or "fouling" of the exhaust system or otherwise adversely affecting engine performance is required.

PHASE II: Fabricate and install a working prototype on an M1 tank or M2 Bradley fighting vehicle. Demonstrate a feed-rate of at least one gallon per minute, while maintaining an aerosol cloud with an extinction coefficient of at least 1 m2/gm across the 3-5 and 8-12 um EM range. Continuous operation for at least 90 min without "gumming" or "fouling" of the exhaust system or otherwise adversely affecting engine performance is required.

PHASE III DUAL-USE APPLICATIONS: Develop a production capability to produce thousands of gallons of performance mixture. If modifications to the exhaust are necessary, develop a low-cost protocol to retrofit the existing systems to accommodate the reaction parameters.

REFERENCES:

3. Tedeschi, S., Improving Aerosol Dispersion Through a Fundamental Understanding of Interparticle Forces, etd.fcla.edu/UF/UFE0021643/tedeschi_s.pdf


KEYWORDS: infrared, obscuration, in situ, diesel fuel, extinction