365g Biocidal Coatings for the Military

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Military coating systems typically consist of an inorganic pre-treatment, an epoxy primer, and a polyurethane topcoat for the exterior of vehicles and structures. Until recently, tactical vehicles, etc. that were in contact with chemical and biological warfare agents could be decontaminated by using a harsh, but effective decontaminate called DS-2. However, due to environmental issues, DS-2 has been replaced with super tropical bleach, which is much less effective at decontamination of these materials. This work seeks to introduce multifunctional hyperbranched polymers and nano-particles with biocidal activity into coatings systems to self-decontaminate exposed military equipment or improve the efficacy of the bleach. The biocidal agents act by diffusing to the surface during coating preparation, where their functional groups, such as quaternary ammonium salts and silver nano-particles, interact with and kill microorganisms and/or catalytically degrade chemical warfare agents. Furthermore, these multifunctional biocides contain functionality that can chemically react into the coatings. These military coatings systems are exceedingly complex. Solvent evaporation, polymer cross-linking, and pigment settling all take place while biocide diffusion and reaction occur. Nevertheless, contact angle results show that the hyperbranched biocides modify the surface properties, while having minimal effect on the bulk and interfacial properties of the coatings. Furthermore, these hyperbranched modified coatings systems have shown efficacy at killing various microorganisms, including bacteria and yeast.