PROTECTION - SCIENCE AND TECHNOLOGY ADVANCES FOR CHEMICAL AND BIOLOGICAL PROTECTION

Highly Durable Membranes With Carbon Nanomaterials For Protection Of Chemical Warfare Agent

Kyeong Min Cho Agency for Defense Development **Kyubo Kim** Agency for Defense Development **Young Ho Jin** Agency for Defense Development **Heesoo Jung** Agency for Defense Development

Selectively permeable membranes are a promising candidte as protective suit and filtration system. However, traditional polymer membranes have limited separation of volatile organic compounds (VOC) and chemical warfare agent (CWA) due to its extremly low chemical stability. Carbon nanomaterials including carbon nanotube (CNT) and graphene shows high resistance to organic chemicals, acids and bases. Thus, we suggested the all carbon membrane which block the CWA with long-term stabilitiy. The protective membrane consists of one-dimensional (1D) CNT bundles and 2D graphene nanosheets as a support layer and selective layer, respectively. The interlayer spacing of graphene was tuned via thermal and chemical reduction and crosslinking of ethylenediamine (EDA) below 0.4 nm to effectively block the CWA vapors and penetrate the water molecules. As a result, the CNT/EDA-GO membranes exhibit the high water vapor transmission rate (WVTR; ~4000 g m-2 day-1) and nearly zero of agent vapor transmission rate during 3 days. Breathable protective barrier with carbon nanomaterials will be widely used for personnel and collective protection in the future.

This research was funded by agency for defense development (Project No.912762101)