Phenoxylated dextran-functionalized smart carbon nanotube platform for inflammation
photothermal therapy

한승민, 엄조은[1], 함승주, 김우재[1,†]
연세대학교; [1]가천대학교

Near-infrared (NIR) photothermal therapy using biocompatible single-walled carbon nanotubes (SWNTs) is advantageous because as-produced SWNTs, without additional size control, both efficiently absorb NIR light and demonstrate high photothermal conversion efficiency.. Herein, we designed a smart targeting photothermal therapy platform for inflammatory disease using phenoxylated dextran-functionalized SWNTs (pD-SWNT). Phenoxylated dextran is biocompatible and efficiently suspends SWNTs by non-covalent $\pi$-$\pi$ stacking thereby minimizing SWNT bundle formations and maintaining original SWNT optical properties. Furthermore, it selectively targets inflammatory macrophages by scavenger receptor binding. It is experimentally demonstrated that pD-SWNT are also biocompatible, selectively penetrate inflammatory macrophages over normal cells, and exhibit high photothermal conversion efficiency. Consequently, NIR laser-triggered macrophage treatment can be achieved with high accuracy by pD-SWNT without damaging receptor-free cells. This smart targeting material could be a novel photothermal agent candidate for inflammatory disease.