Multilayer nanocomposite films composed of anatase TiO$_2$, ZnO and Al$_2$O$_3$ nanoparticles were fabricated on cationically modified woven cotton fabrics by the layer-by-layer molecular self-assembly technique. For a cationic surface charge, cotton fabrics were pre-treated with 2,3-epoxypropyltrimethylammonium chloride (EP3MAC) by a pad-batch method. X-ray photoelectron spectroscopy (XPS) and scanning electron microscopy (SEM) were used to verify the presence of deposit nanolayers. Nano-TiO$_2$ deposition enhanced the protection of cotton fabrics against UV radiation, ZnO deposition enhanced the antibacterial protection and Al$_2$O$_3$ deposition enhanced the Limited Oxygen Index (LOI) properties of cotton fabrics in comparison with the untreated cotton fabrics.