Al₂O₃ nanoparticles were used for fabrication of multilayer nanocomposite film deposition on cationic denim fabrics by electrostatic self-assembly to improve the mechanical properties. Denim fabrics were pre-treated with 2,3-epoxypropyltrimethylammonium chloride (EP3MAC) by a pad-batch method for cationic surface charge. Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy (FTIR-ATR), X-ray Photoelectron Spectroscopy (XPS) and Scanning Electron Microscopy (SEM) were used to verify the presence of deposit nanolayers. CIELab analysis was performed on the fabrics before and after the treatment with Al₂O₃ nanoparticles by the layer-by-layer deposition method. After aging processes, the effect of layer-by-layer deposition method on the tensile strength properties of denim fabrics were also investigated.