Abstract: In this study; functionalization of cotton fabrics with maleic acid (MA) which was a polycarboxylic acid, was investigated. Polycarboxylic acids are effective cross-linking agents when inorganic salts of acid containing phosphorus are used as catalyst. Sodium hypophosphite (SHP) is often used as a catalyst in applications. SHP is an effective catalyst. However, it is also a material that is very costly, causes yellowing of the fabric and has harmful effects to the environment. Therefore, in this study, usage of aluminum oxide (Al$_2$O$_3$) as a co-catalyst with SHP was investigated to decrease the amount of SHP as a catalyst. When different concentrations of SHP and Al$_2$O$_3$ nano-particles were used as catalysts in the application of MA to the cotton fabrics, wrinkle resistant and flame retardant properties of the fabrics were investigated. The whiteness degree, air permeability, wicking rate and strength of the treated fabrics were also investigated. As a result of the tests, flame retardancy, wrinkle recovery angle and char yield of the treated samples increased as air permeability, rates and velocity of wicking in the fabrics decreased when Al$_2$O$_3$ nano-particles were used as co-catalyst. It was determined that, whiteness index of cotton fabrics treated with MA at catalyzed with Al$_2$O$_3$ co-catalyst was higher than yellowness index of cotton fabrics treated with MA catalyzed only SHP catalyst.