The aim of this study was to develop flame retardant, crease resistance and air permeability properties of cotton fabrics by applying different polycarboxylic acids and Al2O3 nano-particles. In the study, butane tetra carboxylic acid (BTCA) and maleic acid (MA) catalyzed by sodium hypophosphite were used to embed Al2O3 nano-particles on the surface of cotton fabric. The fabrics cross-linked by polycarboxylic acids and treated with Al2O3 nano-particles were tested to investigate flame retardancy, resistance against creasing and air permeability properties. The strength of the all treated fabrics was also investigated. The yellowness and whiteness index of cross-linked fabrics by BTCA, BTCA-MA with catalyzed by sodium hypophosphate and treated with Al2O3 nano-particles was measured by spectrophotometer. The presence of Al2O3 nano-particles on the fabrics and cross-linked cellulose structure were investigated by SEM and FT-IR spectroscopy, respectively. In conclusion, it was observed that flame retardancy of the fabric increased with increasing BTCA amount as it decreased with the increasing in MA concentration. However, wrinkle recovery angle, flame retardancy and also air permeability of the fabrics was increased with the increasing in Al2O3 concentration from 0.1% to 0.5%. Yellowness index of the fabric increased with increasing BTCA amount while it decreased with the increasing in MA concentration. When the concentration of Al2O3 nano-particles increased from 0.1% to 0.5%, yellowness index decreased.