The band structure of pure and Ti-alloyed anodic aluminum oxide has been examined as a function of Ti concentration varying from 2 to 20 at. %.

X-ray absorption spectroscopy reveals that Ti atoms are not located in a TiO2 unit in the oxide layer, but rather in a mixed Ti-Al oxide layer. The optical band gap energy of the anodic oxide layers was determined by vacuum ultraviolet spectroscopy in the energy range from 4.1 to 9.2 eV (300–135 nm). The results indicate that amorphous anodic Al2O3 has a direct band gap of 7.3 eV, which is about 1.4 eV lower than its crystalline counterpart (single-crystal Al2O3). Upon Ti-alloying, extra bands appear within the band gap of amorphous Al2O3, mainly caused by Ti 3d orbitals localized at the Ti site.