



Effect of annealing temperature on the TiO₂ anodized films properties for dental implant application

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Abstract

The TiO₂ anodized films generated at low current density after annealing are good candidates for surface coating, as a hydrophilicity is a crucial characteristic that determines dental implant applications. In this study, the hydrophilicity of TiO₂ anodized films annealed at various temperatures was examined. It was found that increasing the annealing temperature during the anodization procedure improves the hydrophilicity of the TiO₂ anodized films. This is related to the evolution of the TiO₂ anodized film structure produced by raising the annealing temperature, which converts the TiO₂ anodized amorphous phase to rutile phases. Moreover, increased annealing temperature results in more oxygen vacancies, hydroxyl groups, and roughness, which further improves hydrophilicity.

When compared to our earlier studies, the amount of F decreases with increasing annealing temperature. This finding implies that fluorine may be doped into the TiO₂ lattice. As for the anodized films produced by two-step anodization with 1 M H₃PO₄ + 80 v/v C₂H₅OH + 4 wt% NaF. F 1s XPS spectra at 684.24 eV might be attributed to F anions physically absorbed on the surface of TiO₂. However, nearly no F 1s XPS spectra were found on anodized films annealed at 800°C and 1000°C as shown in Figure 1.

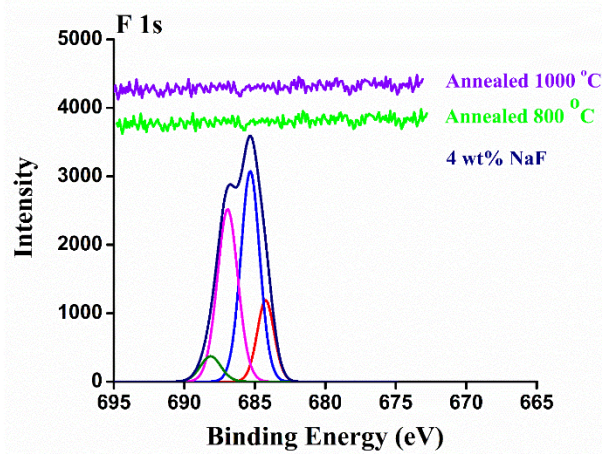


Figure 1. F1s XPS spectra of the anodized films before and after annealing.