

## Surface Evaluation of Photoactivated TiO<sub>2</sub> Films

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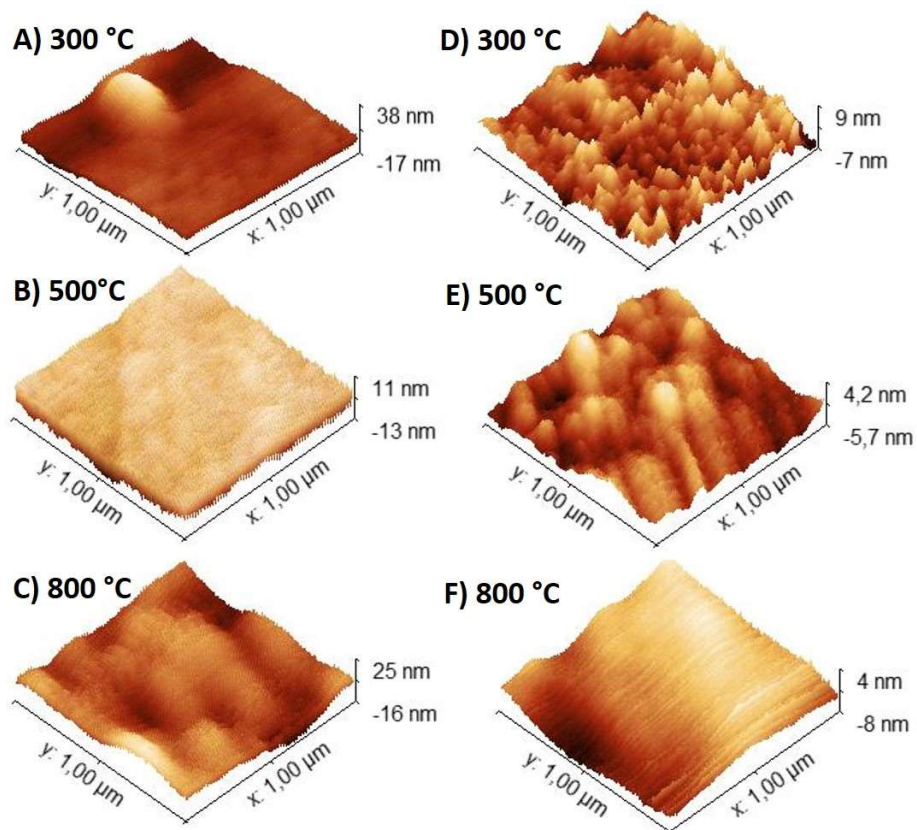
In recent years, the applications of titanium dioxide (TiO<sub>2</sub>) films include water and medical treatment [1]. These applications depend on the following characteristics of the TiO<sub>2</sub> films: specific surface area, crystal and grain size, concentration and dopant. TiO<sub>2</sub> films can be synthesized through different methods and used to produce biosensors due to their high biocompatibility [2-3]. We present the morphology of TiO<sub>2</sub> films, deposited on a quartz substrate at room temperature by DC magnetron sputtering using a titanium target with a diameter of 50.8 mm. A TiO<sub>2</sub> ceramic material covers 20% of the titanium target surface. The quartz substrate is cleaned in an ultrasonic bath of acetone (C<sub>3</sub>H<sub>6</sub>O), ethanol (C<sub>2</sub>H<sub>6</sub>O) and distilled water for 5 minutes at room temperature. The deposition is made under an Argon (Ar) atmosphere and a chamber pressure of 7.46 E-6 mbar. The TiO<sub>2</sub> films are post-deposition annealed at different temperatures (300, 500 and 800 °C). The films are treated with ultraviolet light (UV) for 15 minutes at room temperature to photoactivate the surface. To characterize the topography of the TiO<sub>2</sub> films, the samples are analyzed by atomic force microscopy (AFM) in a non-contact mode and processed using Gwyddion software. The AFM technique showed the transition of anatase to rutile phase. Figure 1 shows typical topography three-dimensional (3D) images (1 μm × 1 μm scan area) of TiO<sub>2</sub> films annealed at different temperatures. Table I showed the measured root-mean-square (RMS) surface roughness changes from 2.28 nm to 7.18 nm when treated with UV, this change causes a greater affinity with neuronal cells.

### References

- [1] J. Molina-Reyes, et al., *Catalysis Today* (2018).
- [2] F.Lopez-Huerta, et al., *Materials*. 7 (2014) 4088-4100.
- [3] B. Cervantes, et al., *Materials*. 9 (2016) 1-11.

**Table 1.** Average values of the crystalline grain size of TiO<sub>2</sub> films annealed at different temperatures.

Heat Treatment (°C)	RMS (nm) with UV	RMS (nm) without UV
300	7.18	2.28
500	4.92	1.38
800	5.47	2.36



**Figure 1.** AFM images of the surface of TiO<sub>2</sub> films annealed at different temperatures: A-C) with UV, D-F) without UV.