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AFM and XPS characterization of TiN thin films grown on nanoporous Al_2O_3 by using the DC sputtering technique assisted by balanced magnetron

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Thin coatings continually are in progress and also them applications. Simple thin films present better results with other metal doping in shape of multi-shells y nano-shells, sequential shell and combinations of shells with different characteristics.

The constant track toward miniaturization of integrated circuits has stimulated the developing for more advanced techniques for deposition of TiN thin films exhibiting high purity and especial properties. [1].

All the thin films were deposited at room temperature in a Intercovamex V3 DC-sputtering system assisted by balanced magnetron, Deposition was performed by sputtering a 99.99 % titanium target into an environment of high-purity molecular nitrogen. Layers were deposited on anodized aluminum (nanoporous alumina) without any pre-cleaning process. The base pressure in the growth chamber was maintained in the 10^{-3} Torr.

Ti target was sputtered during 1 hour by using a direct 3" magnetron with a nominal power, during the evaporation, of 500W. The substrate was remaining at room temperature. [2].

TiN films were grown under the same conditions on anodized Aluminum substrates. The anodization times were: 4 hrs, 8 hrs, 16 hrs and 24 hrs. The differences on the anodization time respond to the reason to obtain a good distribution of nanoporous in the Al_20_3 obtained by this way. As we can see in Fig. 1 the size and shapes of the particles deposited on the nanoporous are different among them, obtaining the best distribution in the substrates anodized after12 hrs. The XPS results (Fig. 2) show elements like Ti, N, O and C. However, by analyzing the binding energy of the Ti and the respective for N we note the presence of the TiN compound in the substrate. Is possible in a future to improve the method to obtain good Al_20_3 nanoporous and find the best conditions to have that TiN thin film with major hardness.

References

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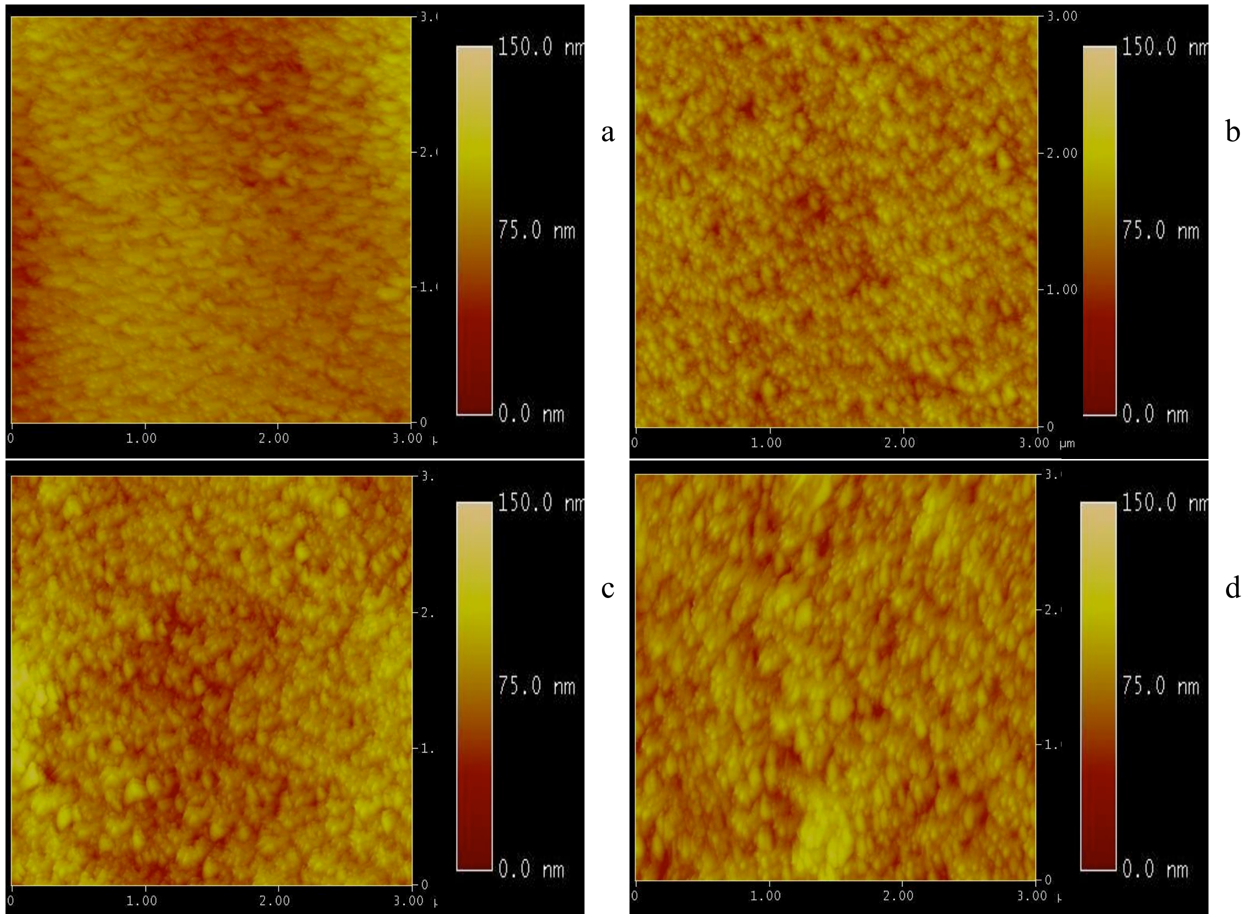

FIG. 1. AFM Images of TiN thin films deposited on different substrates

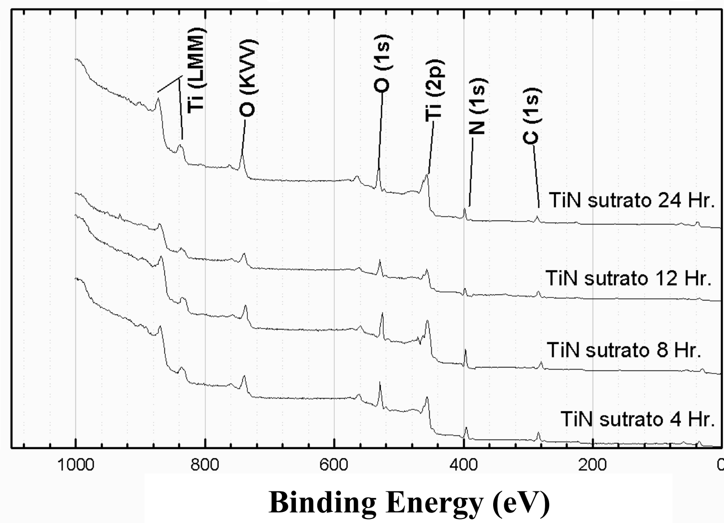

FIG. 2. XPS spectra of TiN samples on different substrates