

Highlights

- The Ti thin films were prepared by electron beam evaporation on stainless steel.
- Corrosion resistance of the Ti/SS films increases with higher annealing temperature.
- The generalized fractal dimension of the Ti/SS films surface has similar trend at annealing.

Abstract

Ti and TiN thin films were deposited by means of electron beam evaporation on stainless steel substrates, and subsequently annealed at different temperatures (650, 750 and 850 °C) in a nitrogen atmosphere. The surface morphology of the films studied by atomic force microscopy (AFM), was found to exhibit specific multifractal properties depending on the annealing temperature. It turned out that the width of the multifractal singularity spectra, $f(\alpha)$, decreased as the annealing temperature increased up to 750 °C, but it increased when the temperature was kept at 750 and 850 °C accompanied by the rapid development of the surface objects. The generalized fractal dimension followed a similar trend. On the other hand, the corrosion resistance of the specimens was studied by the potentiodynamic polarization test in 3.5% NaCl solution at room temperature, observing improved corrosion protection of the films remarkably due to the presence of very thin titanium nitride outer layer.