Investigation of mechanical properties of the TiN thin films deposited on the various types of substrates based on the combination of nanoindentation and numerical modeling.

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ABSTRACT

The evaluation of the nanoindentation test capabilities in the investigation of mechanical material behaviors of TiN thin films deposited on the different substrates is the primary goal of the research. This particular work is focused on the determination of flow stress characteristics and fracture behaviors of TiN thin films based on a series of nanoindentation tests and finite element calculations. TiN films obtained by the Pulsed Laser Deposition were selected as a case study for the investigation [1]. They were deposited on the different substrate materials and investigated through the nanoindentation test. To properly recalculate measured load-displacement values into the required stress-strain curve and to determine fracture initialization and propagation factors, a finite element approach is used. Subsequent stages, including deposition process of TiN thin film, room temperature nanoindentation tests, and development of a numerical model which takes into account concept of the digital material representation (DMR) and cohesive zones type elements [2,3] are described in this work. Examples of obtained results presenting capabilities of the proposed approach are also highlighted.

REFERENCES

