Dilatometric method of testing the thermal stability of the wear-resistance thin films

P. Myśliński[*], P. Kamasa[**], A. Gilewicz[*], J. Staśkiewicz*

[*]*Koszalin University of Technology, 75-453 Koszalin, ul. Śniadeckich 2, Poland*

[**]*Research Institute for Solid State Physics and Optics of Hungarian Academy of Sciences 1525 Budapest, POB 49, Hungary*

Abstract

In the work we present dilatometric investigation the thermal stability of the wear-resistance thin films by the method developed and tested at the Koszalin University of Technology. The films were deposited by **Physical Vapour Deposition technique.**

The thermal stability was determined from measuring the linear deformation of the coated substrate as a function of temperature. A range of temperatures during the testing was from room temperature to 800^{o}C at the maximum. To study the mechanical interaction in the adhesive film-substrate system quantitatively, the model of the substrate was chosen cylindrical in shape or in form of a thin ribbon. Changes in elongation of specimens being tested were recorded using the Linear Variable Differential Transformer (LVDT). The resolution of changes in elongation of tested specimens is about 0.01 μm. Application of the **modulated changes in temperature** of a dilatometer heating system permits to obtain the resolution of measurements adjusted to expected changes in the substrate deformation. The technique is known as the Modulated-Temperature Dilatometry (MT DIL), or Thermomechanical Analysis (TMA), or Dynamic Mechanical Analysis (DMA).

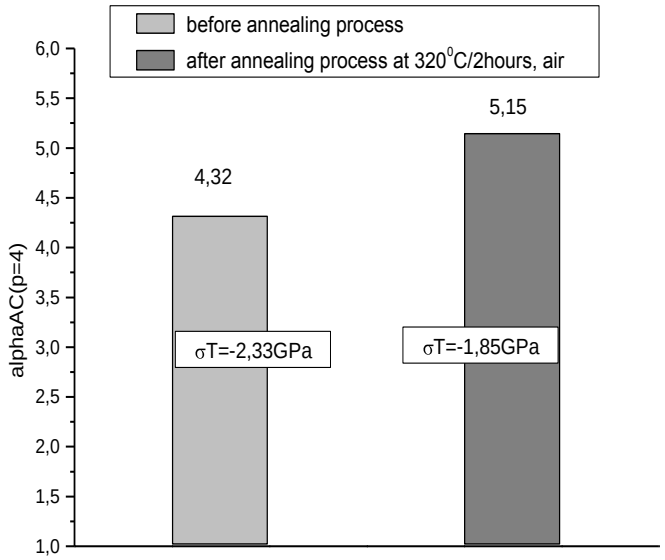

Figure presents the result of testing the thermal stability of TiN thin film coated on iron substrate in the shape of thin ribbon, annealed at 320°C by 2 hours in the air atmosphere. The coefficient of the thermal expansion (CTE) is in relation with the volume of stress obtained from XRD.

The work was realised in the frame of project coordinated by Institute for Sustainable Technologies – National Research Institute, Radom, Poland. Project No. PW-004/ITE/09/2005