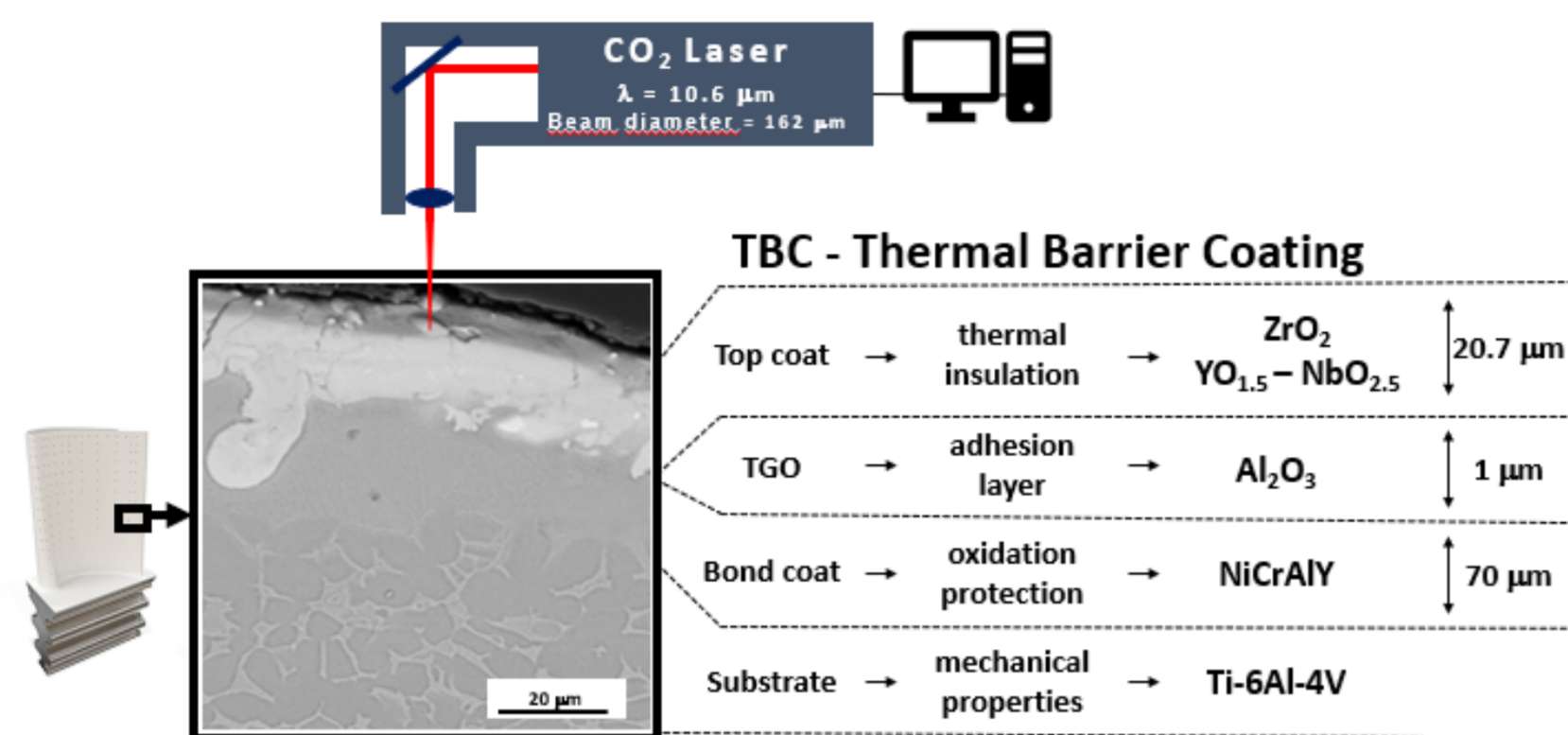


Cyclic oxidation performance and microstructural stability of Ti-6Al-4V with TBC

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INTRODUCTION



The TBC system consisted of a metallic substrate, a bond coat (BC), a thermally grown oxide (TGO), and a ceramic top coat (TC) composed of zirconia stabilized with 16.0 mol% equimolar yttria and niobia, consolidated by CO₂ laser processing.

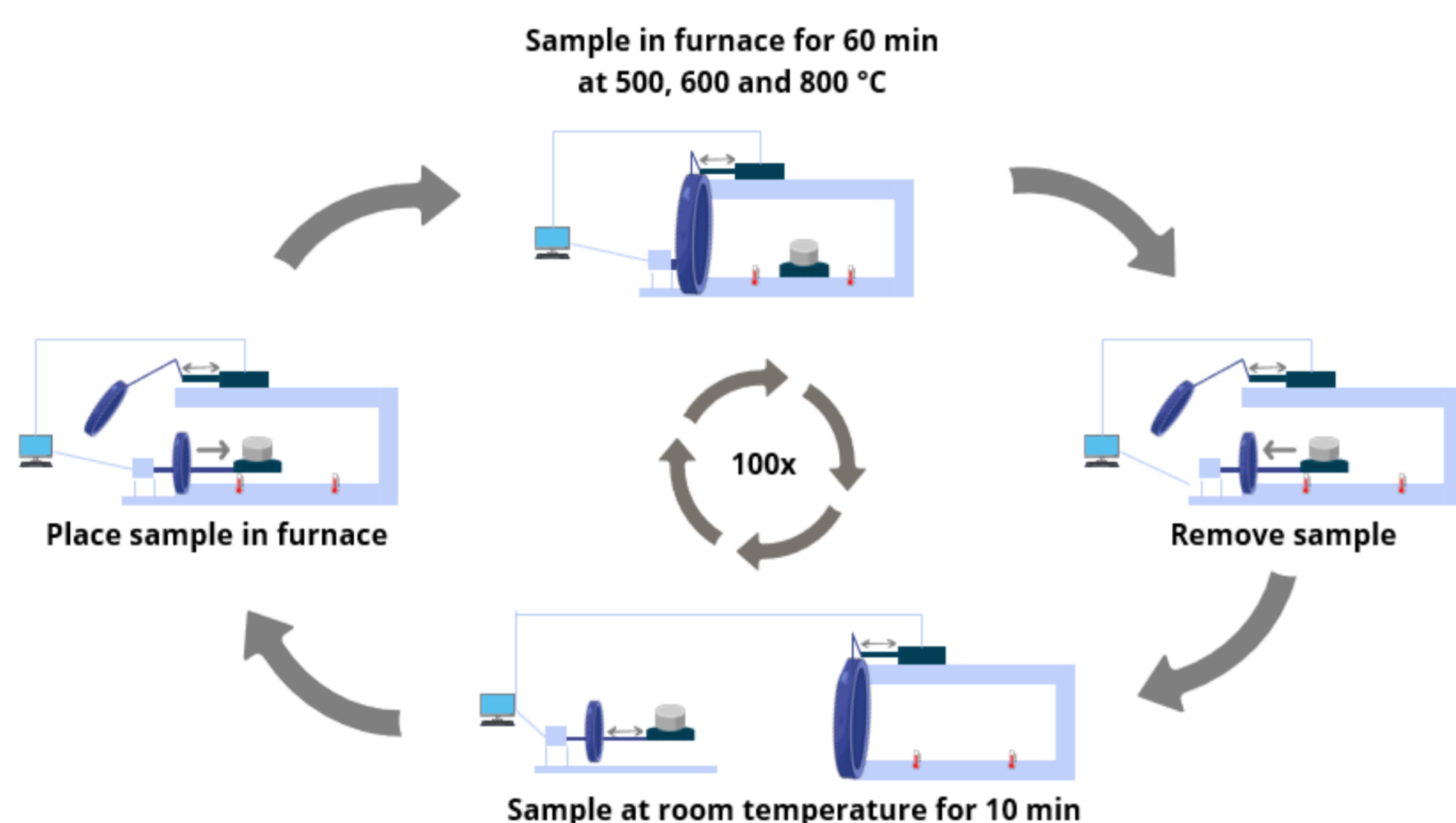
Figure 1 – Microstructure of TBC after cyclic oxidation testes by SEM. Properties and materials of TBC application on blades turbine.

Adapte Takahashi et al, 2018; Takahashi et al, 2025.

OBJECTIVE

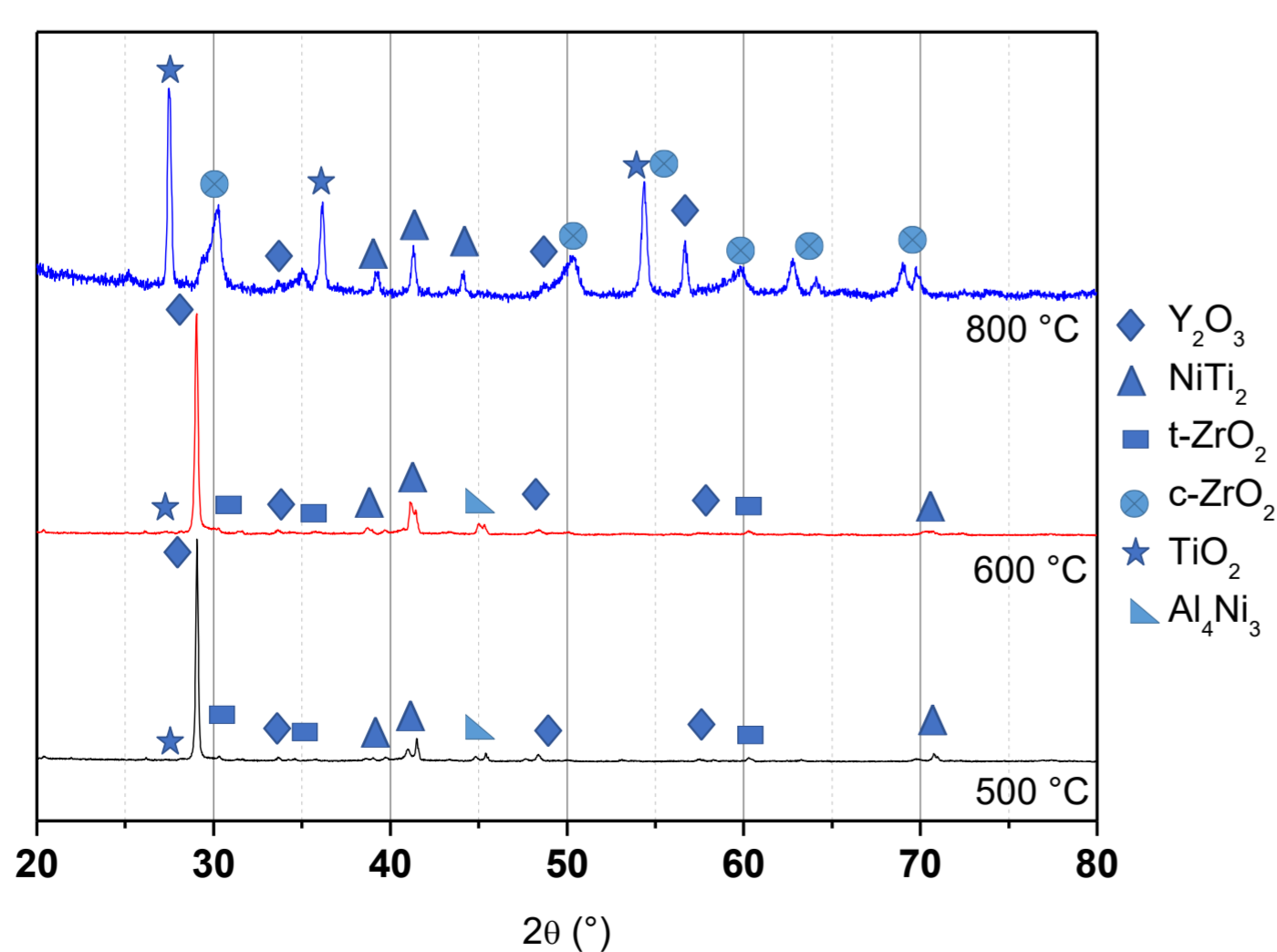
This study aimed to evaluate the microstructural evolution of Ti-6Al-4V alloy with TBCs subjected to 100 thermal oxidation cycles at 500, 600, and 800 °C.

METHODOLOGY



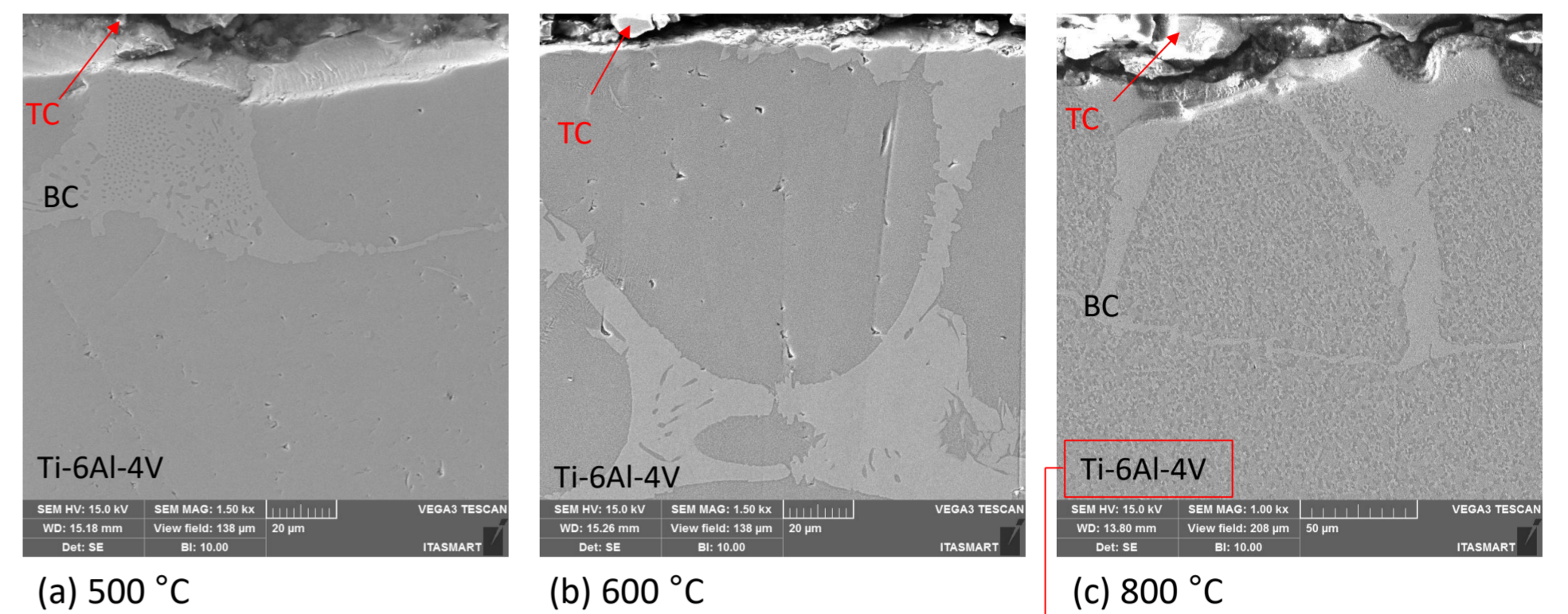
RESULTS

XRD patterns of the TBC surface after cyclic oxidation testing.

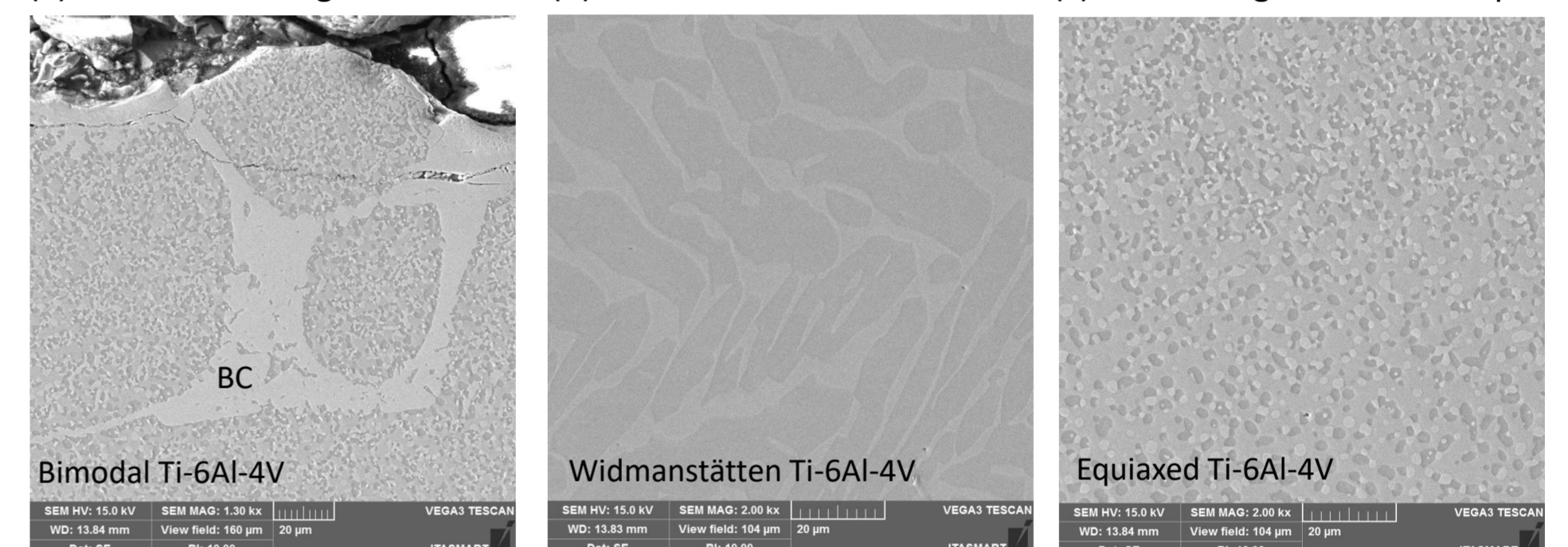


RESULTS

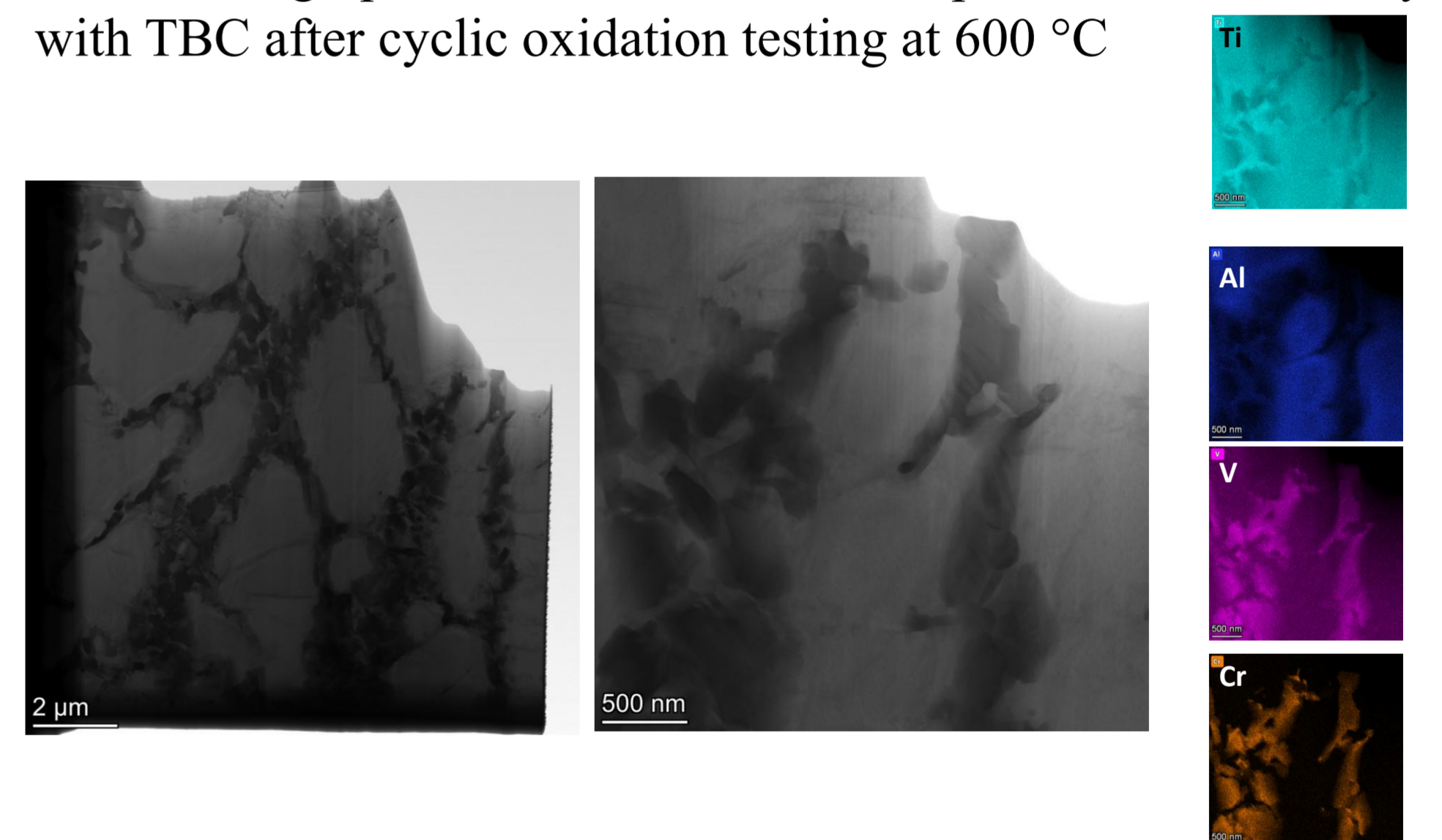
SEM micrographs of Ti-6Al-4V alloy with TBC after cyclic oxidation testing.



(a) Near surface region. (b) Beneath the BC interface. (c) Central region of the sample.



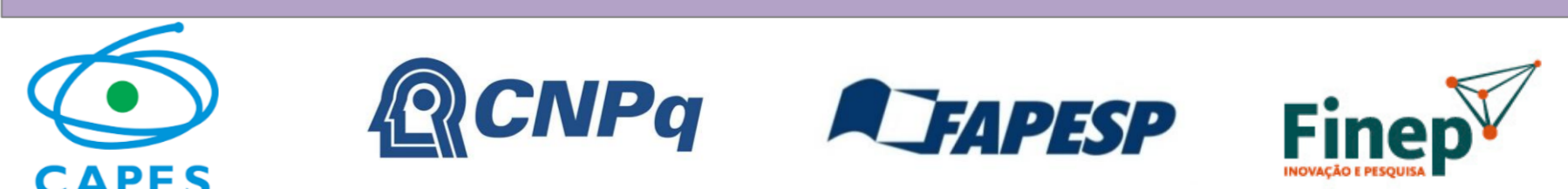
TEM micrographs and EDS elemental maps of Ti-6Al-4V alloy with TBC after cyclic oxidation testing at 600 °C



CONCLUSIONS

The TC layer was identified by XRD analysis; however, partial delamination was observed along the surface. Even so, the TBC system preserved the alloy microstructure at 500 and 600 °C. TEM and EDS analyses confirmed the TBC structure and a thermally affected area of the coating at 600 °C. At 800 °C, microstructural changes were detected in the substrate due to the combined effects of processing heat and the cyclic oxidation test. These results demonstrate the effectiveness of TBCs in increasing oxidation resistance and maintaining microstructural stability under cyclic thermal exposure, thus contributing to improved durability of titanium alloys for aerospace applications.

ACKNOWLEDGMENTS



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