Summary

Thermal Barrier Coating (TBC) which is consist of 8YSZ topcoat and NiCoCrAlY bond-coat are used to protect NiCoCrAlY super-alloys at high temperature application for their corrosion and thermal fatigue resistance. In this research, topcoat and bond-coat are developed on substrate using plasma spraying process, then the thermal fatigue at 900°C for 300 minutes and 25°C for 15 minutes are given as cyclic until the material failed. SEM-EDS and X-RD test are applied respectively after thermal fatigue to see the phase and microstructure transformation at bond-coat and substrate interface.

Scanning Electron Microscope study on top coating showed microstructure changes after thermal fatigue, many micro-cracking were formed and joined which caused spallation of the ceramic coat. Ceramic ZrO2 Phase was changed after thermal fatigue testing. Transformation from tetragonal ZrO2 to monoclinic ZrO2 brought volume expansion which caused failure to top coat.

From the research results, it can be concluded that specimen oxide suffer crack and failed at 42nd cycle (210 hours). The microstructure changed with the decrease of porosity and the increase of oxide and dark phase (Ni3Al). ZrO2 and Ni3Al phase are found in the as sprayed specimen, and Ni3Al major phase are found in the oxide specimen. While Al, Cr, and Ni are found decrease by mean of mass percent, Co are found increase by mean of mass percent.

At bond-coat area, it can be concluded that the color in specimen is change, the porosity stage is reduced, and more oxide formation in the specimen after thermal. Phase after thermal is prior to be Ni3Al than ZrO2 and the composition of bond coat element (Al, Co, Cr) is decreasing except Ni element (increasing).

**Keywords:** NiCoCrAlY, Thermal Fatigue, Thermal barrier Coating, Phase, Microstructure