## ABSTRACT

## RESISTANCE OXIDATION OF STEEL A238 COATED ALUMINIUM AT TEMPERATURE 750 °C

## by

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A238 steel is a low alloy steel very important in meeting manufacturing. Applications A238 is tubular steel for low and medium pressure fluid, boiler, and steam pipeline system at the plant. However, when working in high temperature environments, the A238 steel oxidation resistance decreases. To overcome the application of the aluminium layer on the steel surface of the A238 made by coating method (hot dipping aluminium coating) through a process of dipping into the liquid aluminium at a temperature of 700 ° C for 1 minute immersion with the aim of enhancing oxidation resistance. Weight gain to oxidation over a period of 1-49 h at a temperature of 750 °C is used to determine the rate of oxidation kinetics. Oxidation mechanisms learned through oxidation results on each test specimen by using OM (Optical Microscope) and SEM / EDS (Scaning Electron Microscope)/(Energy Dispersive X-Ray Spectrometer).

The oxidation test A238 steel were performed at 750 °C obtained ratio of weight change of coated steel A238: 0,01138 mg/mm<sup>2</sup> and uncoated: 0,778 mg/mm<sup>2</sup>. The high oxidation A238 steel coated A238 about 68 times in condisition dry air. Parabolic rate constant ( $k_p$ ) steel coated 2,5×10<sup>-9</sup> mg<sup>2</sup> mm<sup>-4</sup> s<sup>-1</sup> and uncoated 2,56×10<sup>-6</sup> mg<sup>2</sup> mm<sup>-4</sup> s<sup>-1</sup>. The formation of Fe-Al intermetalic layers for the coated steel oxidized for 9 h, is mainly dominated by the inward diffusion of Al. However, after 49 h oxidation the intermetallic phases formation were controlled by interdiffusion of Al and Fe atoms. Intermetallic phases in the aluminide layers consist of Fe<sub>2</sub>Al<sub>5</sub>, FeAl<sub>2</sub> dan FeAl after isothermal oxidation for a periods of time 1-49 h. The aluminium atoms in the intermetalic layer have two roles during oxidation process; one is the outward diffusion of Al to form Al<sub>2</sub>O<sub>3</sub> scale, and the other is the inward diffusion of Al toward the steel subsrate to form FeAl<sub>2</sub> and FeAl intermetalic phases.

Keywords: A238 steel, hot dipping aluminium coating, high temperature oxidation, parabolic rate constant  $(k_p)$ , intermetallic, protective Al<sub>2</sub>O<sub>3</sub> layer.