Comparative Studies on Microstructure and Hardness of Plasma-Sprayed Al_2TiO_5, ZrO_2 and Cr_2O_3 Ceramic Coatings on Al-Silicon (LM13)

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1 Introduction

LM13 alloy retains higher mechanical properties such as high strength and high hardness even at the higher operating temperatures. This makes LM13 as a suitable material for IC engine components and aerospace materials because of its low weight and high specific strength. Present emerging technologies contain most protruding constant developments, advances, and modernizations in different engineering and scientific areas to improve the surface characteristics by the utilization of modern techniques. There are a variety of characteristics that are improved by implementing surface alteration methodologies such as mechanical, thermo-mechanical, tribological, electrical, and optical properties. Aluminium alloys have attractive physical and mechanical properties. They are lightweight, low costs production (with sand casting technology), easy to machine, and have good recycling possibilities (up to 95%) [1]. Due to these facts, their application in automotive and other industries is increasing. One of the applications in automotive industry is replacing of material for engine blocks, which has been traditionally made entirely of grey cast iron. Today, more than 60% of the engines for passenger cars are produced in cast aluminium alloys [2] with some concrete examples [3]. Over the last 10 years, there has been intensive development in methods to coat the cylinder bore of aluminium cast engine blocks for the automotive industry [4–9]. Several thermal spray processes were developed for the cylinder bore application during the last 15 years [4–9]. The typical bond strength according to ASTM C 633–79 is 40 to 50 MPa for aluminium cast alloy and 50–70 MPa on grey cast iron substrate. The typical as sprayed thickness is between

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