

Experimental Optimization in Diamond Lapping of Plasma Sprayed Ceramic Coatings

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Abstract : Plasma spraying, from the point of value engineering, is considered as a cost-effective technique to deposit high performance ceramic coatings on ferrous substrates for use in the aero, automobile, electronics and semiconductor industries. High-performance ceramics such as Alumina, Zirconia, and titania-based ceramics have become a key part of turbine blades, automotive cylinder liners, microelectronic and semiconductor components due to their ability to insulate and distribute heat. However, as the industries continue to advance, improved methods are needed to increase both the flexibility and speed of ceramic processing in these applications. The ceramics mentioned were individually coated on structural steel substrate with NiCr bond coat of 50-70 micron thickness with the final thickness in the range of 150 to 200 microns. Optimal spray parameters were selected based on bond strength and porosity. The 'optimal' processed specimens were super finished by lapping using diamond and green SiC abrasives. Interesting results could be observed as follows: The green SiC could improve the surface finish of lapped surfaces almost as that by diamond in case of alumina and titania based ceramics but the diamond abrasives could improve the surface finish of PSZ better than that by green SiC. The conventional random scratches could be absent in alumina and titania ceramics but in PS those marks were found to be less. However, the flatness accuracy could be improved unto 60 to 85%. The surface finish and geometrical accuracy were measured and modeled. The abrasives in the midrange of their particle size could improve the surface quality faster and better than the particles of size in low and high ranges. From the experimental investigations after lapping process, the optimal lapping time, abrasive size, lapping pressure etc could be evaluated.

Keywords : atmospheric plasma spraying, ceramics, lapping, surface quality, optimization

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