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The review of applied research and developemnt of surface engineering technology in GZRINM

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The modern surface engineering technology has become one of key technologies in new-high technology fields after near 30 years of rapid development. It can provide materials surface with new and special properties, such as high hardness, low friction coefficient, good wear resistant etc., so it shows its special advantage in modern new-high technology fields.

A research and development base has been set up in Guangzhou Research Institute of Non-ferrous Metals (GZRINM) with many advanced surface techniques equipments and analysis instruments, as well as many excellent engineers after more than 20 years development. Many achievements have been made in thermal spray technology, thin film technology and laser engraving technology in GZRINM. It owns low pressure plasma spray equipment with robot inside, air plasma spray equipment, high velocity oxygen flame equipment, multi-arc ion plate equipment, magnetron sputtering equipment with ion source, direct current plasma jet CVD equipment, YAG and CO_2 laser engraving equipment, scanning electron microscope, optical microscope, hardness instrument and so on. It obtained more than 50 scientific awards from government, including two national grade second awards. 19 research projects have been taken on about surface engineering technology from central government and local government since 1998. Some of them are as follows.

(1) High energy plasma spray and laser engraving technology and its application in ceramic coating anilox roll;

(2) Processing and application of thermal spray for substitute of electronic plating hard Cr coating;

(3) Superalloy coating and its application in blade of aircraft engine;

(4) Coating technology for continuous casting crystallizer in steel industry;

(5) Research of HVOF coating on land gear for substitute of hard Cr coating;

(6) HVOF WC/Co coating on corrugated roll;

(7) Research into DLC/Ti loudspeaker;

(8) DLC film and its application to Ti transmission system of aircraft;

(9) Large area DLC film and its application to tool and mold;

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(10) Nano-multilayer superhard film and its application to tool and mold;

(11) Constituting of national standard of four materials surface technologies.

Various new productions have been developed through these project, such as ceramic coating anilox roll, which is a integration of thermal spray technology and laser engraving technology; superalloy coated aircraft blade; WC/Co coated corrugated roll; DLC film /Ti coated loudspeaker; DLC coated optical disk mold; superhard multilayer film coated PCB micro-drill. The properties of these coatings and films have reached a relatively high level. For examples, the Ti doped DLC made by magnetron sputtering has very smooth surface, low friction coefficient (0.16), high hardness (Hv2000), relative large thickness, good adhesive strength (more than 50N), grading chemical composition etc.; WC + 12Co coating made by HVOF has high hardness (Hv1400), low porosity (less than 0.5%), good adhesive strength (more than 100 MPa), and much lower wear rate than electron plating hard Cr coating.