

- 1) A) Explain the properties and applications of
- (i) Al_2O_3 (iii) Si_3N_4
(ii) SiC (iv) P_5Z .

(i) Al_2O_3
properties:

- (i) Electrical Insulator
- (ii) High thermal conductivity
- (iii) Insoluble in water
- (iv) Amphoteric
- (v) High hardness.

Application:

- (i) Fillers, glass
- (ii) Catalysis
- (iii) Gas purification
- (iv) Abrasive
- (v) Paint and composite fibres.

(ii) SiC
properties:

- (i) Substantially high thermal conductivity.
- (ii) Low fracture resistance
- (iii) Less resistance to acid
- (iv) Good resistance to angular abrasion.

Application:

- (i) Sand blasting Injection.
- (ii) water Pump scale
- (iii) Bearing
- (iv) pump components.

(iii) Si_3N_4

Properties:

- (i) More strong and toughness
- (ii) low density
- (iii) high temperature strength.
- (iv) good fracture toughness
- (v) excellent wear resistance
- (vi) good oxidation resistance.

Application:

- (i) Aerospace industry.
- (ii) Electronic industry.
- (iii) Biomedical industry.
- (iv) Hypersonic industry.
- (v) Welding.
- (vi) Bearing.

(iv) P_sZ (Partially stabilized Zirconia)

Properties:

- (i) High strength.
- (ii) High toughness
- (iii) Excellent wear resistance
- (iv) Excellent corrosion resistance.

Application:

- (i) Metal forming
- (ii) Gas and oil industries
- (iii) Remarkable strength.
- (iv) Cycle industry Application.

1) B) Explain the principle, component preparation, deposition rate and coating materials of various plasma spraying methods.

- (i) APS - Atmospheric plasma spraying.
- (ii) VPS - vacuum plasma spraying.

(i) APS - Atmospheric plasma spraying.

A material is heated to high temperature in plasma are generated at atmospheric pressure.

Component preparation:

- (i) Plasma Torch
- (ii) powder feeder.
- (iii) Gas supply.

The plasma Torch generates the plasma are, which heats the coating material to high temperature. The powder feeder is used to feed the coating material into the plasma, where it melts and propelled onto the substrate gas supply is used to control shape and velocity of plasma are.

Deposition rate:

The deposition of coating with thickness ranging from 30 micrometer to many millimeter in dimension at temperature ranging ambient at 1200°C . The deposition rate ^{depends} differs of on power of plasma Torch, flux rate of powder feeder.

Coating material:

- (i) Metal alloys
- (ii) Carbides
- (iii) Blends
- (iv) Abrasives
- (v) Oxide ceramic
- (vi) Ceramics.

VPS - vacuum plasma spraying.

Vacuum plasma spraying is a thermal spray process used to deposit coating on various surface in this process a material can be heated to high temperature in a vacuum chamber, creating plasma gas. This gas is distributed by the substrate.

component preparation:

component used are.

- (i) Plasma Torch.
- (ii) Powder feeder.
- (iii) a vacuum chamber.
- (iv) argon gas.

the plasma Torch generates plasma, which heats coating material to high temperature the

powder feeder is used to feed coating material into plasma. where it melts and propelled into substrate. the vacuum chamber is used to create a low pressure environment, so that material do not React with air.

Deposition Rate :

(i) Depends on various factors

(a) Power of Torch

(b) fuel Rate of powder.

(c) Distance between torch and substrate

(ii) higher power plasma torches and high fuel Rate of power can increase the ~~exp~~ Deposition Rate.

coating Material:

(i) ceramics

(ii) metal

(iii) alloys.

The coating material must be able to withstand high temperature generated by plasma torch and have good adhesive properties to substrate. The coating material must have good wear Resistance, good corrosion resistance (or) thermal insulation.