Synthesis and Evaluation of DLC Films for use in Different Environmental Conditions

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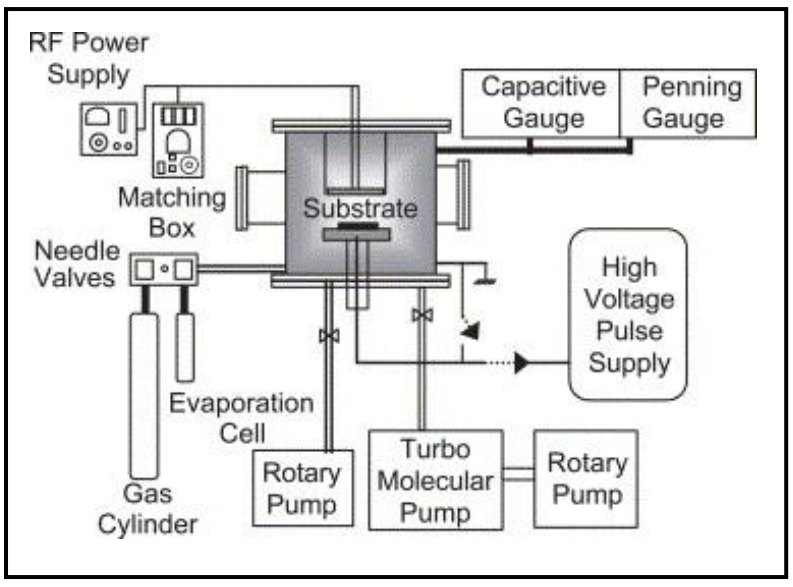
Introduction

Plasma immersion assisted deposition (PIAD) is an effective deposition technology for synthesising high quality carbon thin films. A graded layer structure which can mitigate delamination and improve adhesion can be achieved by this combined implantation and deposition technique. Hydrogen containing diamond like carbon (a-C:H) films exhibit an ultra-low sliding coefficient of friction (CoF) in dry or inert (e.g. vacuum) environments; however, the CoF of a-C:H changes dramatically with increasing humidity. Silicon-doped a-C:H (Si-DLC) or fluorine-doped a-C:H (F-DLC) films can show better humidity adaptability compared with a-C:H films. In this study, diamond-like carbon films with different silicon doping contents were deposited by PIAD with different experimental parameters.

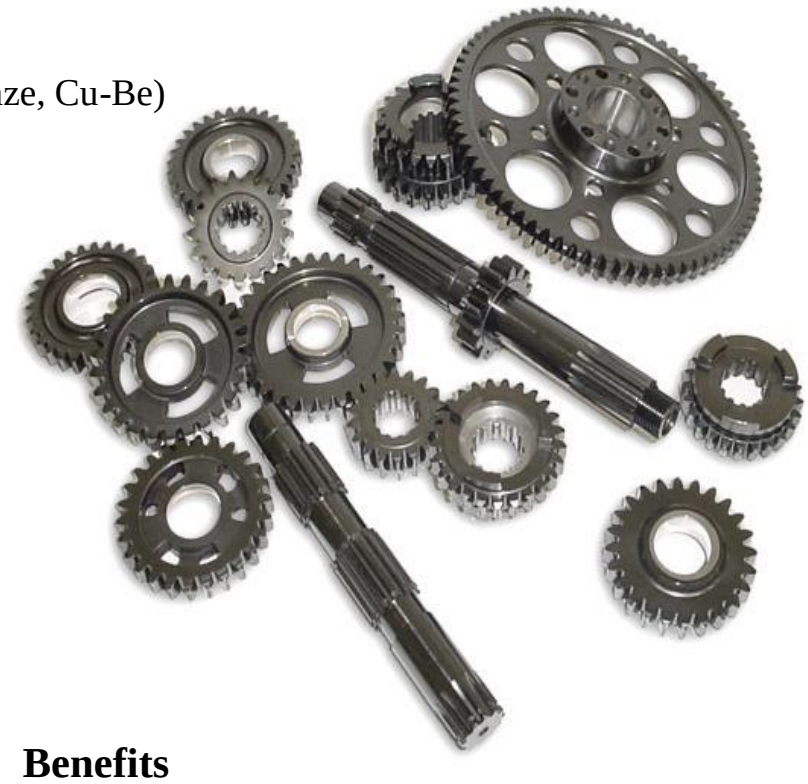


Experimental equipment

- Plasma-immersion ion implantation (PI^3) system
- Pin-on-disc tribological tester
- DEKTAK 150 surface profilomter
- Scanning electron microscope (SEM)/Transmission electron microscopy(TEM)
- Energy Dispersive X-ray (EDX)/Raman Spectroscopy

Substrates

- ✓ Steels, ferrous alloys in general
- ✓ Aluminium and its alloys
- ✓ Titanium and its alloys
- ✓ Copper and its alloys (bronze, Cu-Be)
- ✓ Tungsten carbide



Fields of application

- Automotive and Racing (gears, rocker arms, valves, fuel distribution systems)
- Medical (prosthesis, screws for implants, ISO 10993)
- Food (FDA approved)
- Textiles
- Aerospace/Military
- Pumps and compressors
- Tools (drills and cutters for the machining of Al), moulds and dies

Benefits

- ✓ High Hardness: 10-80 GPa
- ✓ Low friction Coefficient: CoF<0.01
- ✓ Excellent for contacts in absence of lubricant
- ✓ Compact (impermeable to gases)
- ✓ Electrical insulation
- ✓ Biocompatible

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