SEMICONDUCTOR PROCESS CHAMBER COATINGS: IMPROVING PERFORMANCE AND UPTIME

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Corrosion resistance is a critical property for semiconductor processing chamber components. Corrosive plasmas are omnipresent is semiconductor deposition processes, including plasma enhanced chemical vapor deposition (PECVD), physical vapor deposition (PVD), and etching. Process chamber cleanliness during plasma processing is becoming increasingly important as device feature sizes shrink. Particles that originate from erosion of the chamber components can lead to device yield losses, and eventually will result in the process chamber requiring the replacement of chamber components that are exposed to such plasmas. Thus the chamber components coatings are critical for tool performance and uptime.

I will review how the semiconductor process industry approaches ceramic coatings on complex metallic parts. Aluminum oxide and yttrium oxide based coatings that have shown significant benefit in application versus alternatives (Figure 1). These coatings can be deposited using anodization, CVD, PVD, and thermal spray. Material choices and deposition techniques are chosen based on coating performance, compatibility with substrates, and cost. In some instances, ceramic components are used where metallic components are not suitable, such as high temperature susceptors. I will compare how coatings used in the semiconductor industry are similar and different to those in the aerospace industry.

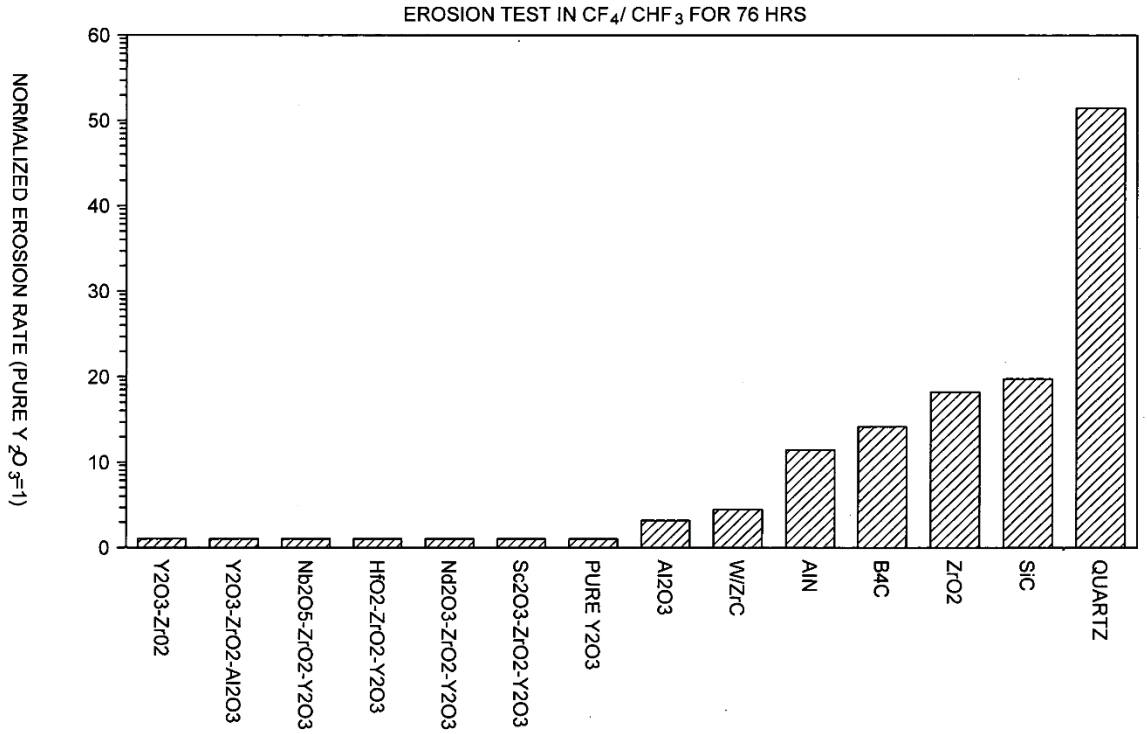

Figure 1 – Erosion of various materials in fluorine plasma