Vacuum Deposition and Coating Options for Product Finishing

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ABSTRACT

The product finisher is facing many challenges as the overall coating industry is changing with increased regulations, competition and performance requirements. It covers some recent rulings on the use of hexavalent chromium, which is driving the electroplating industry to look at new chemistries and new processes like vacuum coating. This study provides an overview of a range of physical vapor deposition (PVD) and chemical vapor deposition (CVD) coating technologies. Some notable finishing companies such as Kohler have embraced vacuum coating as a technique to make a better product.

INTRODUCTION

Many finishers are looking at new coating processes that may be more environmentally friendly or more economical. New processes called "dry" processes such as vacuum deposition are being seriously considered since they involve no aqueous component of the deposition process [1,2,3,4].

EXPERIMENTAL

Atomic Layer Deposition

Atomic layer deposition (ALD) is a form of CVD where two or more chemical vapor precursors react sequentially over a surface, causing a self-limiting surface reaction and forming a thin molecular film a few angstroms thick. An inert carrier gas is used in which the reactants and carrier flows over the surface. Forming a traveling wave over the surface where the precursors are injected as pulses of chemicals.

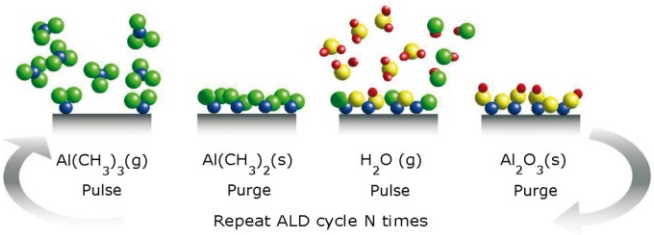

Figure1. ALD process to deposit Al_2O_3 over a surface. This shows a 4 step cycle involving a trimethylaluminum pulse, purge, water vapor pulse forming Al_2O_3 followed by a purge. [image provided by Beneq Oy, Vantaa, Finland]

CONCLUSIONS

As one can see there are many resources and experiences with PVD, PECVD, ALD as industrial coating processes. Many different vacuum deposited coatings are available for a variety of applications including decorative, wear, and corrosion resistance.

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