Thin Film Deposition

PVD Cluster

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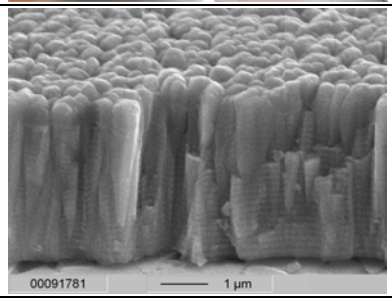
Technologies:	– PVD 2D Coating – PVD 3D Coating – CVD/PVD Hybrid Coating Technology
Short technology description:	**PVD 2D Coating** By reactive and non reactive magnetron sputtering 2-dimensional samples can be coated without additional heating with metallic or ceramic films in a thickness of 10 nm to 5 µm in order to improve surface properties of the substrates or to allow complete new properties of the system. The deposition process runs in a noble gas atmosphere within the Pa pressure range in a dc or r.f. plasma process. Thin films can be realized for protective and functional applications. Multilayer or sandwich coatings with up to four different materials can be realized without breaking vacuum.

Material class:	Silicon	Polymer	Metal	Ceramic	Glass	Organic	Other
			X	X	X		

Typical structures and designs:

PVD Thin film deposition facility Leybold Z550



Fracture surface of a TiN/ZrN multilayer coating

Special features:	– Single and multilayer modus – Reactive gas components N_2, CH_4, O_2 – Different coating concepts like nanocomposites, multilayer and graded coatings are possible – Typical targets: metals, ceramics, glasses – Protective (wear resistant) and functional (ferromagnetic) coatings
Limitations, constraints:	– Max. sample height 20 mm – Max. four targets – Target size ø75 mm and ø150 mm – No conductive limitations of material
Material examples:	– Directed coating; no coating inside of tubes or holes – Surface topography and roughness will be reproduced
Publications	[1] M. Stueber, U. Albers, H. Leiste, S. Ulrich, H. Holleck, P.B. Barna, A. Kovacs, P. Hovsepian, I. Gee, Surface and Coatings Technology, 200,22-23(2006)6162-6171 [2] H. Holleck, H. Leiste, M. Stüber, S. Ulrich, Z. Metallkd. 94(2003)5 [3] V. Bekker, K. Seemann, H. Leiste, J.Magn.Magn.Mater. 296(2006)37-45

Short technology description:	**PVD 3D Coating** By reactive and non reactive magnetron sputtering two- or three-dimensional samples can be coated at temperatures between 200 °C and 400 °C with metallic or ceramic films in a thickness of 100 nm to 5 µm in order to improve surface properties of the substrates or to allow complete new properties of the system. The deposition process with balanced and non balanced magnetron regime runs in a noble gas atmosphere in a pressure range of Pa in a plasma dc process. Plasma cleaning process before coating is mandatory. Rotating of samples is commonly used.

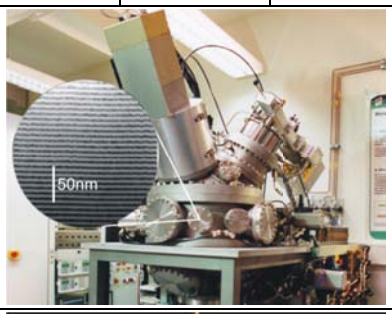
Material class:	Silicon	Polymer	Metal	Ceramic	Glass	Organic	Other
			X	X			

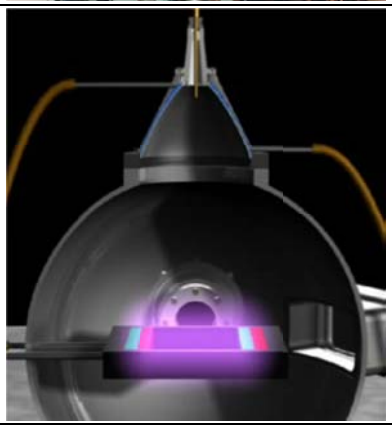
Typical structures and designs:

PVD Thin film deposition facility Hauzer HTC625

Coated tools and components

Special features:	– Three fold rotation – Stop and go modus (two fold rotation in front of one target) – Reactive gas components N_2, CH_4, O_2 – Multilayer and graded coatings possible – Typical targets: metals electrical, conductive ceramics
Limitations, constraints:	– Max. sample height 350 mm – Temperature range 200 °C -400 °C – Electrical conductive substrate – Max. two conductive targets
Material examples:	– Directed coating; no inside coating of tubes or holes
Publications	[4] M. Stueber, U. Albers, H. Leiste, S. Ulrich, H. Holleck, P.B. Barna, A. Kovacs, P. Hovsepian, I. Gee, Surface and Coatings Technology, 200, 22-23, (2006), 6162-6171 [5] M. Stüber, H.Leiste, S.Ulrich, H.Holleck, D.Schild, Surface and Coatings Technology 150(2002) 218-226

<table>
<tr><td>Short technology description:</td><td colspan="7"><h2>CVD/PVD Hybrid Coating Technology</h2>By r.f. or dc reactive and non reactive magnetron sputtering as well as micro wave plasma source deposition two-dimensional samples can be coated at temperatures between 100 °C and 900 °C with metallic or ceramic films in a thickness of 100 nm to 5 µm to improve surface properties of the substrates or to allow complete new properties of the system. The deposition processes are running in gas atmosphere consisting of Ar, N_2, O_2, CH_4 and/or C_2H_2 in a pressure range of 0.1 Pa and 10 Pa. Plasma cleaning process before coating is mandatory. The samples are fixed on the substrate holder. A dc or r.f. substrate bias can be applied.</td></tr>
<tr><td>Material class:</td><td>Silicon</td><td>Polymer</td><td>Metal
X</td><td>Ceramic
X</td><td>Glass</td><td>Organic</td><td>Other</td></tr>
<tr><td rowspan="2">Typical structures and designs:</td><td colspan="7"> 

CVD/PVD- hybrid coating apparatus</td></tr>
<tr><td colspan="7"> 
3D-CAD sketch of a patented high performance plasma source</td></tr>
<tr><td>Special features:</td><td colspan="7">– Using of max. 3 magnetrons and 2 microwave plasma sources simultaneously
– Reactive gas components N_2, C_2H_2, CH_4, O_2
– Multilayer and graded coatings and nanocomposites possible
– Typical targets: metals electrical, conductive ceramics
– No substrate rotation</td></tr>
<tr><td>Limitations, constraints:</td><td colspan="7">– Max. sample height 10 mm
– max. sample diameter: 75 mm
– Temperature range 100 °C - 900 °C
– Electrical conductive or non conductive substrates
– Max. 3 conductive or non conductive targets</td></tr>
<tr><td>Material examples:</td><td colspan="7">– Directed coating; no inside coating of tubes or holes</td></tr>
<tr><td>Publications</td><td colspan="7">[6] M. Lattemann, S. Ulrich, Surf. Coat. Technol. 201 (2007) 5564-5569</td></tr>
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