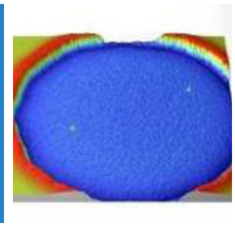
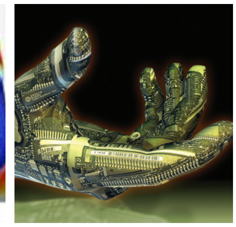
GDOES

GDOES, the analytical companion tool for magnetron sputtering deposition





Application Note

Material Science GD34

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Abstract: Pulsed RF GDOES is a companion analytical tool for magnetron sputtering deposition

Key words
magnetron sputtering, coatings, pulsed RF GDOES, characterization, depth profiling, Glow Discharge Optical Emission Spectrometry

Introduction

Magnetron sputtering is a type of Plasma Vapour Deposition (Ref 1 & 2). The vacuum chamber of the PVD coating machine is filled with an inert gas, such as argon. By applying a high voltage (RF, HIPIMS etc), a glow discharge is created, resulting in acceleration of ions to the target surface and a plasma coating. The argon-ions will eject sputtering materials from the target surface (sputtering), resulting in a sputtered coating layer on the products in front of the target. Often an additional gas such as nitrogen or acetylene is used, which will react with the ejected material (reactive sputtering). A wide range of sputtered coatings is achievable with this PVD coating technique. Magnetron sputtering technology is very advantageous for decorative coatings (e.g. Ti, Cr, Zr and Carbon Nitrides), because of its smooth nature. The same advantage makes magnetron sputtering widely used for tribological coating in automotive markets (e.g. CrN, Cr_2N and various combinations with Diamond Like Carbon (DLC) coating.

Magnetron sputtering is somewhat different from general sputtering technology. The difference is that magnetron sputtering technology uses magnetic fields to keep the plasma in front of the target, intensifying the bombardment of ions. A highly dense plasma is the result of this PVD coating technology.

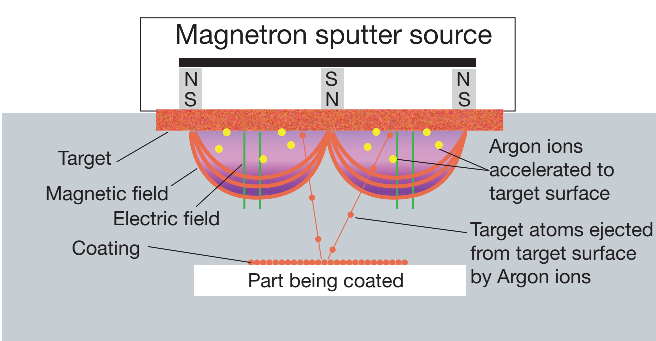

Figure 1: Magnetron principle

The GD plasma as analytical companion tool

The principle of our dense GD plasma will look familiar to practitioners using magnetron sputtering , we have even the possibility to add some magnetic fields to our source (our patented RF coupler) - the obvious difference being the size.

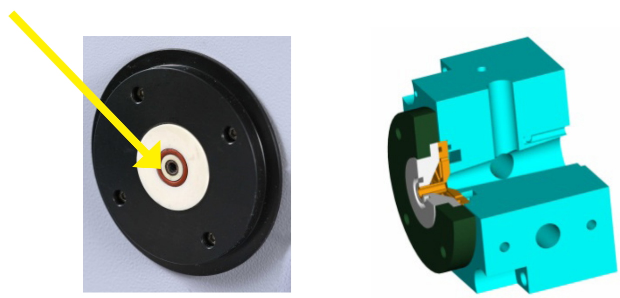

Figure 2: The GD source (typical 4mm diameter)

The other difference of course is the finality of the instrument! GD uses the plasma to sputter the final coated products and provide elemental depth profiling analysis with excellent depth resolution (Ref 3).

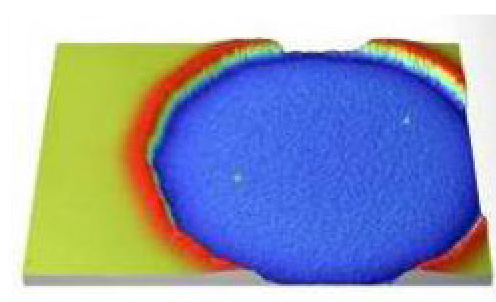

Figure 3: The GD source (typical 4mm diameter)

Figure 4: GD Profiler 2

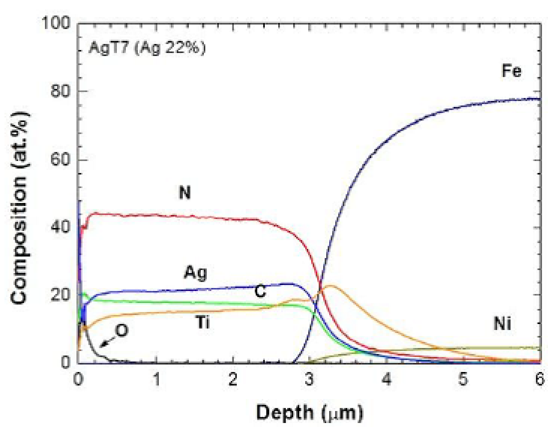

Figure 5: From Ref 4, GD depth profile of a coating deposited by magnetron sputtering

Conclusion

For all people using magnetron sputtering, a fast elemental depth profile control of the deposited layers on a test sample allows optimizing the deposition parameters and checking the stability of the process.

References

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