Measure ultra-thin Au/Pd coatings using MAXXI6

Introduction

The electroless nickel electroless palladium immersion gold (ENEPIG) plating is a commonly used process in the PCB and SMT industry because the ENEPIG process addresses many of the new packaging reliability needs, and meets lead-free / ROHS requirements. ENEPIG is a good soldering surface, a good wire bondable surface, aluminium wire bondable surface, as well as a contacting surface.

Due to the complexity of the application, in the past, only the XRF system with PIN diode detector was used for this application such as the XS980 supplied by Oxford Instruments.
In recent years, more capable XRF instruments have been introduced for plating thickness measurement which uses the silicon drift detectors (SDD) technology. The SDD detectors offer a major advantage over the common proportional counter or PIN diode detector used in XRF's employed in the plating industry in terms of energy resolution.

As explained in detail on the IPC4556 document which is the latest specification for ENEPIG plating, the advantage the SDD detectors offer is primarily in the Au layer measurement. In the case of Au, the Au L-β peak and the Br K-α peaks can be better resolved, reducing overlap interference. Furthermore, the Au L-α peak is fully resolved from any overlap with the Cu K peaks. As a result, the Au L-α peak may be used without resorting to deconvolution techniques. Peak deconvolution is especially difficult to apply well when plating thickness becomes very thin. For Au layers less than 3 micro inches (75 nm), peak deconvolution methods can struggle to achieve good accuracy when Br is present. In addition, the nature of the peak deconvolution method requires excellent electronics stability to maintain measurement accuracy over an acceptable period of time. In some cases, instrument design does not offer the required stability to avoid frequent drift correction and recalibration.

Use of SDD detector based XRF systems eliminates the need for peak deconvolution methods with respect to Au thickness measurements and permits Au measurements of layers less than 1 micro inch (25 nm). Therefore, SDD detector XRF systems tend to offer much better long term measurement stability and are much less reliant on operator know-how and vigilance to achieve accurate Au results.

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This application note illustrates the capability of MAXXI6 to measure ENEPIG* coating when the Au layer is less than 10 nm.

		Au	Pd	Ni
0.3 mm collimator 60 seconds	Average of 25 repearts	0.0086	0.0253	1.0768
	Given Value	0.0091	0.027	1.039
	Standard deviation	0.0008	0.0026	0.0053
	Precision (95% confidence)	0.0016	0.0052	0.01
	Relative standard deviation%	9.3	10	0.49
0.3 mm collimator 120 seconds	Average of 25 repearts	0.0083	0.0245	1.0779
	Given Value	0.0091	0.027	1.039
	Standard deviation	0.0005	0.0017	0.003
	Precision (95% confidence)	0.001	0.0034	0.006
	Relative standard deviation%	6	7	0.27

Conclusion

MAXXI 6 provides excellent capability with its superior SDD detector technology and state of the art design. It provides excellent result for Au layer thickness even below 10 nm. The performance guarantees that the MAXXI 6 can fulfil today's very challenging industry demands and could comply well with the most up to date industry standards such as IPC4556.

* Due to the availability of standards, we use the pure Au/Pd/Ni/Cu standards to set up the application and generate the data.

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