IPC-4553A

Specification for Immersion Silver Plating for Printed Boards

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Association Connecting Electronics Industries

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Developed by the Plating Processes Subcommittee (4-14) of the Fabrication Processes Committee (4-10) of IPC

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Users of this publication are encouraged to participate in the development of future revisions.

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Specification for Immersion Silver Plating for Printed Boards

1 SCOPE

1.1 Statement of Scope This specification sets the requirements for the use of Immersion Silver (IAg) as a surface finish for printed boards. This specification is intended to set requirements for IAg deposit thickness based on performance criteria. It is intended for use by chemical supplier, printed board manufacturer, electronics manufacturing services (EMS) and original equipment manufacturer (OEM).

1.2 Description IAg is a thin immersion deposit over copper. It is a multifunctional surface finish, applicable to soldering. It may also be applicable for some press fit connections and as a contact surface. It has the potential to be suitable for aluminum wire bonding. The immersion silver protects the underlying copper from oxidation over its intended shelf life. Exposure to moisture and air contaminants, such as sulfur and chlorine, may negatively impact the useful life of the deposit. The impact can range from a slight discoloration of the deposit to the pads turning completely black. Proper packaging is a requirement.

1.3 Objective This specification sets the requirements specific to IAg as a surface finish. As other finishes require specifications, they will be addressed by the IPC Plating Processes Subcommittee as part of the IPC-4550 specification family. As this and other applicable specifications are under continuous review, the subcommittee will add appropriate amendments and make necessary revisions to these documents.

1.4 Performance Functions

1.4.1 Solderability This primary function of IAg is to provide a solderable surface finish, suitable for all surface mount and through-hole assembly applications and with an appropriate shelf life. The deposit has demonstrated the ability to meet a shelf life of 12 months per IPC J-STD-003 and industry data, when handled per this specification's requirements.

1.4.2 Contact Surface There is a possibility for using IAg for the following applications. The use of Immersion Silver is acceptable for the IPC-6010 series Class 1 and Class 2 applications, but is NOT currently recommended for the IPC-6010 series Class 3 applications which are for High Reliability Electronic Products where equipment downtime cannot be tolerated, and the circuitry **shall** function, when required. Examples of such Class 3 applications are for life support items and critical weapons systems.

1.4.2.1 Membrane Switches The IAg surface with as little as 0.1 µm [4 µin] of immersion silver has demonstrated that it is suitable for one million actuations with negligible resistance change. However the end use atmosphere (temperature/humidity/contaminants) may degrade this performance. The end user **shall** determine the impact of use environments on the IAg deposit.

1.4.2.2 Metallic Dome Contacts *Data on this topic should be submitted to the IPC 4-14 Plating Processes Subcommittee to be considered for inclusion in upcoming revisions of this standard.*

1.4.3 EMI Shielding IAg is one of the surface finishes that may be used as an interface between electromagnetic interference (EMI) shielding and the printed board. A key characteristic for this application is a consistent metal interface between the printed board metallization and the shield material. The formation of a highly conductive interface between the two surfaces will ensure excellent EMI shielding capability, which should also provide resistance to atmospheric influences on the IAg deposit. The end user **shall** determine the impact of the end use environment on the reliability of the shield interface. Tarnish of surrounding areas not in contact directly with the shield is NOT a reason to reject the printed board/deposit but rather an indication of the impact of the atmosphere on an active metal.

1.4.4 Aluminum Wire Bonding IAg meets the requirements of MIL-STD-883, Method 2011.7. Variables that affect performance include cleanliness, substrate materials, wire thickness and surface topography. IAg is not a surface leveler; the surface topography largely depends on the conditions of the underlying copper surface. While producing acceptable wire bonds, silver, unlike the other Noble metals used for this application, is potentially not stable due to its reactive nature with the atmosphere in which it exists. Total encapsulation of the wire bonded sites is recommended in order to ensure consistent and reliable long term bonds. The committee is actively seeking additional data on the use of immersion silver as a suitable wire bonding metallization.