Spherolyte® NiFe

Nickel-Iron-Alloy barrier plating

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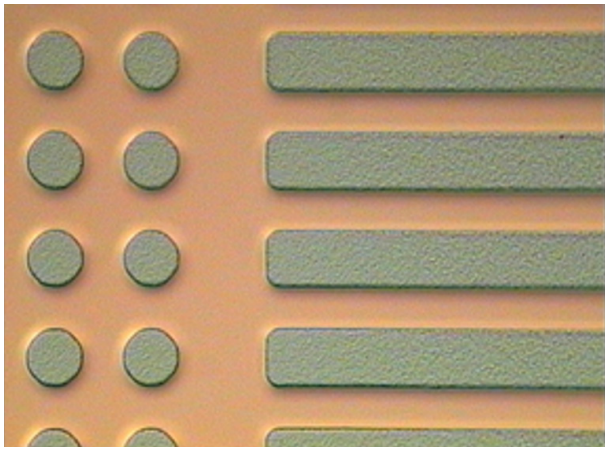
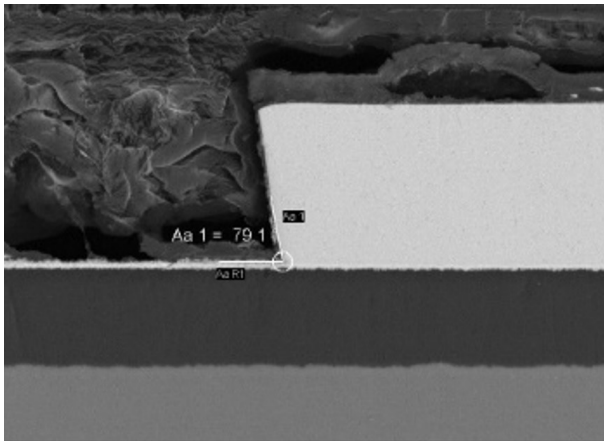
Effective magnetic shielding and diffusion barriers

NiFe – Next generation barrier layer plating

In the domain of advanced semiconductor applications, the co-deposition of iron into nickel offers a dual advantage. By yielding nickel-iron alloys, this process enables potent magnetic shielding, countering electromagnetic interference. Additionally, NiFe allows the use of thinner layers with better diffusion barrier properties compared to standard Ni deposits. These benefits underscore the pivotal role of NiFe co-deposition in enhancing safety and reliability for future semiconductor devices.

Spherolyte® NiFe allows the deposition of such a nickel-iron-permalloy. The process is based on our standard Spherolyte® Ni process which uses sulfamic acid and the use of two additional additives to deposit nickel-iron layers of different ratios.





Features and benefits

- All liquid product – no powder handling required
- Based on sulfamic acid
- Excellent diffusion barrier for Cu
- Excellent magnetic shielding features
- Wide operating window
- Fully analyzable plating system
- Adjustable NiFe-alloy via Fe additive setting

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Nickel-Iron-Alloy – Effective magnetic shielding and diffusion barrier

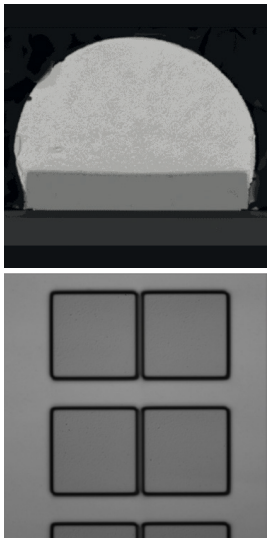

Figure 1-2:
Solder application with NiFe barrier layer (1)
NiFe pads for EMI shielding (2)

Nickel-Iron as advanced diffusion barrier

Our nickel-iron deposits show great diffusion barrier functions between copper substrate and tin/tin-alloy solder deposit. A sublayer between nickel-iron and the solder material is formed which prevents the migration of solder material into the copper structures and vice versa. Hence, the intermetallic formation reduces to a minimum improving the overall reliability and performance of the next-generation microbumps.

Impact of iron content on magnetic properties

The deposition of NiFe with an iron content of roughly 20 % provides highest magnetic permeability and low coercivity countering weak magnetic fields effectively. Ultimately, Spherolyte® NiFe limits magnetic hysteresis which benefits the overall electromagnetic shielding effect.

Robust process and outstanding properties of the deposits

Spherolyte® NiFe allows a wide operating window with regards to general plating conditions such as pH and temperature. The chemical composition enables a long bath life and good stability. Additionally, the system is easy to analyze and maintain, thus allowing the precise deposition of nickel-iron layers.

Basic conditions

- Current density: 2 – 6 ASD
- Deposition rate: 0.4 µm/min at 2 ASD
- Plating efficiency: 95 – 98 % (at 6 ASD)
- Temperature: 50 °C (45 °C – 65 °C)
- pH: 3.2 (2.8 – 3.8)
- Ni anodes: (S*-round or -pellets) / Ti basket
- Filtration: PP or HDPP filter (mesh size 1 µm)
- Compatible with fountain and paddle plater – non membrane type