Tarnishing is a long-established challenge in the silver industry. Oxidation, sulfidation, and corrosion cause discoloration of the silver surface, which decreases the shelf-life of silver products and collector items.

nSILVER® is an industrial-scale turnkey production solution for the protection of silver against tarnishing. It consists of optimized anti-tarnish production equipment and a unique coating process developed and patented by Beneq.

**Benefits of nSILVER:**
- Invisible
- Significant tarnish resistance improvement
- Safe coating materials
- Low cost of operating
- High capacity
- Good fit to existing manufacturing processes and logistics
- Proven and robust technology

**Proven performance**

nSILVER has been subjected to numerous industrially acknowledged anti-tarnish tests, and the results have been overwhelmingly impressive. nSILVER has proven its superior performance in the following tests:

- Salt spray test (DIN 50021 SS)
- Kesternich test (DIN 50018 KFW 0,2S)
- Sweat, seawater, and perfume resistance tests
- Dilution resistance (alcohols and ketones)
- Climate test (DIN 58390-12-120, sharpness grade 7)
- UV exposure test (Sol 2)
- Commercial washing machine test
- Chemical dry-cleaning test
Invisible protection

nSILVER is based on atomic layer deposition (ALD), a coating technology that enables growing of thin films on articles of any shape and orientation. It provides an ultrathin and totally conformal anti-tarnish coating, which is fully transparent on silver. The coating is pinhole-free and extremely uniform over the entire batch of coated articles.

Protection of gold and copper

In addition to nSILVER, which was originally developed and optimized for anti-tarnish protection of silver, Beneq has also developed special coatings to protect copper and gold. All metals (silver, copper and gold) can be coated with the same equipment with special coating stacks, which have been optimized for each metal. nSILVER can also be used to protect multi-metal articles, coins with jewels, painted mints and other more complex collector items.

Eliminating the white spots

The protective properties of nSILVER, besides preventing tarnishing, also impede the formation of white spots, which are material surface flaws characteristic of silver coins.

nSILVER performance in accelerated thioacetedamide corrosion test (ISO 4538:1978)

Two silver coins after 48 h of exposure in an accelerated corrosion test. The nSILVER coated coin (left) shows no visible change, whereas the uncoated coin (right) exhibits severe darkening.

Customer case: Proven in Production

Having used nSILVER in daily production since 2006, Finnish companies Kalevala Jewelry and Lapponia Jewelry are clear in stating their opinion about nSILVER:

“nSILVER has brought about many benefits for both Kalevala Jewelry and Lapponia Jewelry. Compared with other methods available on the market, we found in our screening that nSILVER alone could offer the combination of premium quality anti-tarnish properties and easy integration into our existing production lines.

Together with Beneq, we set up an implementation project that lead to us acquire a Beneq TFS 500 ALD system dedicated to nSILVER for our production. Today, after ten years of continuous production with nSILVER, our customers and our own production team alike are very satisfied. nSILVER enables premium anti-tarnish properties at the same time as it reduces the need for harmful chemicals in our plant.”