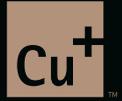


HALCOR

Antimicrobial
Copper



Feel **Safe** - Feel **Protected**



HALCORYOUR PARTNER OF CHOICE
FOR QUALITY COPPER SOLUTIONS

About HALCOR

HALCOR is a leading Group of companies that specializes in the production, processing and marketing of copper, copper alloys and zinc products. It has a dynamic commercial presence in the European and global markets. For more than 75 years, HALCOR has been offering innovative and added-value solutions that meet contemporary client demands in fields such as plumbing, HVAC&R, architecture, automotive, engineering, telecommunications and industrial production.

HALCOR is a Group of nineteen companies, based in Greece, Bulgaria, Cyprus, France, Germany, Italy, Romania and the United Kingdom, operating nine production plants in Greece, Bulgaria and Romania. The Group develops and distributes a wide range of products, including copper and copper-alloy rolled and extruded products and cables with HALCOR being the sole producer of copper tubes in Greece. High quality in production is achieved through strict controls applied throughout the production process. With a consistent quality focus, the company implements an ISO 9001:2008 Certified Quality Management System and utilizes high technologies and employs expert staff.

As a result of the Group's strategic investments in research and development, HALCOR is recognized as one of the leading copper producers globally, setting new standards in copper processing. The company maintains a consistent focus on quality and environmental protection, and a strong commitment to the principles of sustainable development. In this context, all production facilities in the Group's plants utilize advanced technologies to bring in the market innovative products that are energy efficient and environmentally friendly.

More information is available www.halcor.gr.

Wide range of products

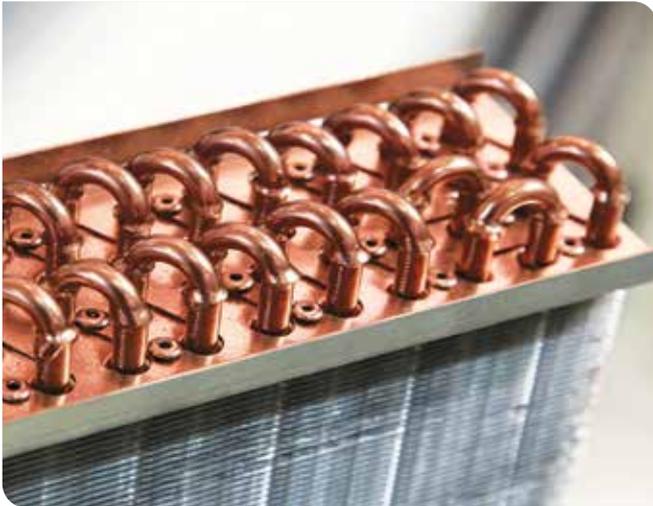
With a long history and strong specialization in metal processing, HALCOR is an innovative Group of companies that develops products of superior technology and high added-value for all building, industrial and architectural applications. Its wide range of products includes:

- **Copper and Brass Tubes**
- **Copper and Brass bars, plates and rods**
- **Copper, Brass and Titanium Zinc sheets and strips**
- **Copper alloys**
- **Cables**

Sustainability is an integral part of the company's strategy. With a strong focus on health & safety and environmental protection and continuous investments in R&D, HALCOR is able to offer innovative, energy efficient and environmentally friendly products that meet the contemporary needs of its customers across the world.

Antimicrobial Copper Cu⁺® brand products

HALCOR is a member of the Copper Alliance and supports the Antimicrobial Copper initiative in raising awareness of Antimicrobial Copper's ability to combat infectious bacteria in health-care facilities, mass transit, educational and office facilities. Moreover, HALCOR has received approval from the Hellenic Copper Development Institute, which is supported by the international network of 24 copper centers ICA, to use the Cu⁺® brand, name and mark. Antimicrobial Copper Cu⁺® products constitute an integrated category of materials that are proven to be more effective than any other product, in continuously killing microbes that cause infections. **The use of Antimicrobial Copper Cu⁺® in touch surfaces, as well as air conditioning and ventilation systems and medical gas networks has been proven to be more effective in the continuous elimination of bacteria that cause serious and dangerous infections, compared to the use of other materials.** This is a scientific validation, backed by peer-reviewed published laboratory and clinical research and independent verification, through the US Environmental Protection Agency (EPA).



The Antimicrobial Copper Cu⁺® range offered by HALCOR includes:

- **COPPER TUBES**
Outside diameter: 4,76mm - 108,00mm
Thickness: 0,25mm - 2,50mm
- **STRIPS**
Thickness: 0,10mm - 4,00mm
Width: 10mm - 1250mm
- **SHEETS**
Thickness: 0,30mm - 4,00mm
Width: 400mm - 1250mm
Length: 400mm - 3500mm
- **CIRCLES**
ø50mm - ø1200mm
- **PLATES**
Thickness: 10mm - 100mm
- **BRASS TUBES**
Thickness: 0,5mm - 2,0mm
Diameter: 8mm - 80mm
- **BRASS BARS**
Round: 25mm - 70mm



ANTIMICROBIAL COPPER: THE NEW STANDARD



Antimicrobial Copper

Antimicrobial Copper Cu+® refers to solid copper and copper-based alloys with a minimum copper content of 60%. Generally, the higher the copper content, the faster the anti-microbial action. The characteristics of Antimicrobial Copper are impressive, in terms of antimicrobial activity and physical properties:

- **Efficacy:** Far more effective antimicrobial action than silver-containing coatings
- **Long lasting action** proven to continuously kill the microbes that cause infections
- **Resistance** with strong antimicrobial action that never wears out and remains effective under harsh conditions
- **Safety:** Not harmful to people or the environment, does not contain any chemicals, completely recyclable
- **Uniqueness:** The only solid surface antimicrobial material that can be marketed with public health claims
- **Scientific proof** backed by extensive testing performed around the world, supporting the claim that Antimicrobial Copper continuously kills more than 99.9% of the bacteria, viruses, fungi and moulds that cause healthcare-associated infections, within two hours of contact
- **Independent verification** with antimicrobial action supported by efficacy data, independently verified and approved by the US Environmental Protection Agency (EPA).

Antimicrobial Copper helps combat healthcare-associated infections

Healthcare-Associated Infections (HCAIs) place a significant burden on healthcare systems across the globe. In the EU, approximately four million people annually acquire a HCAI

and approximately 37,000 die. HCAIs are caused by antibiotic-resistant organisms spreading from healthcare environments to schools, public spaces, sports facilities, mass transit, food hygiene premises and other. Due to its unique qualities and broad-spectrum antimicrobial efficacy, Antimicrobial Copper is recognized as the new weapon in the fight against pathogenic microbes. It can significantly reduce contamination from frequently touched surfaces. In fact, it is the only touch surface material that can continuously kill more than 99.9% of the bacteria causing HCAIs within two hours of contact, even between cleanings. This is because Antimicrobial Copper kills bacteria by rupturing a bacteria's outer membrane and weakening its cells, thus stopping a cell's key functions.

Scientifically Proven Antimicrobial Properties

The antimicrobial efficacy of Antimicrobial Copper Cu+® and copper alloys is backed by science. Laboratory research has been carried out, with over 30 peer-reviewed and published papers, verified by institutions around the world, including the UK, the US, South Africa, Germany, Greece and Japan.

This research has demonstrated that Antimicrobial Copper Cu+® in touch surfaces, as well as air conditioning and ventilation systems and medical gas networks has been proven to be more effective in the continuous elimination of bacteria that cause serious and dangerous infections, compared to the use of other materials.

Moreover, copper exhibits antimicrobial efficacy under typical indoor humidity and temperature conditions, as opposed to silver-containing materials and Triclosan. In addition, the ongoing antimicrobial action of copper remains effective even between routine cleaning and sanitising steps and even after the surface has been scratched or after repeated recontamination.

ANTIMICROBIAL COPPER RESEARCH AND APPLICATIONS IN GREECE

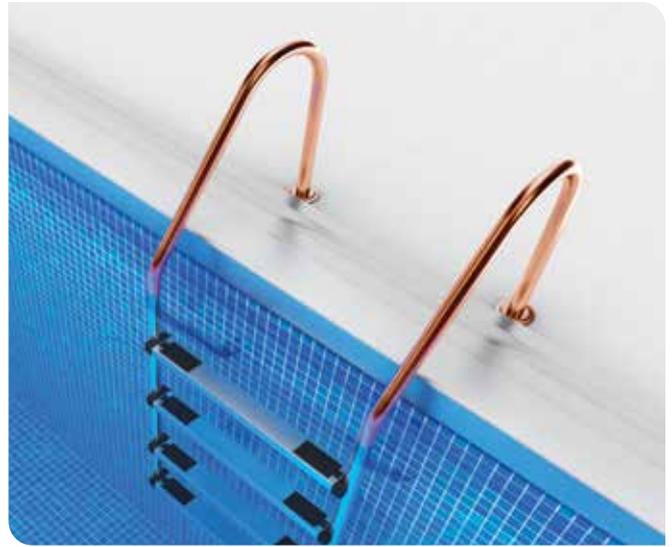


The HALCOR Group is a member of the Hellenic Copper Development Institute (HCDI) and is working in partnership with the HCDI to support scientific research and applications for antimicrobial copper in Greece. These include the following:

The installation of copper doorknobs and banisters at two school primary education buildings (housing a total of five primary education school units) of “Filekpaideftiki Etaireia - Arsakeio” (at the areas of Ekali and Psyhiko) as an additional effective measure to stop the spread of dangerous bacteria in schools. According to the results of a study carried out by the scientific team of the HCDI in collaboration with the Biopathology Laboratory of “Aretaieio” University Hospital of Athens, application of antimicrobial copper in these educational facilities, showed significant reduction of microbial flora. This resulted in a reduction of epidemiological data regarding the flu-like syndrome, infection (common flu), during the school year of 2011 - 2012.

The installation of Antimicrobial Copper bed frames, as well as handrails, doorknobs and banisters at the “Attikon” University General Hospital of Greece, is marked as the first Antimicrobial Copper implementation at hospital units of the NHS. The studies conducted by the scientific team of the HCDI and the doctors of “Attikon” University General Hospital, showed significant reduction of microbial flora in its ICU.

The installation of Antimicrobial Copper handles, knobs, touch surfaces, push bars, food trays, offices of doctors and heads nurses, as well as at the ICU of “Peiraiko Hospital” in Piraeus, resulted also to the significant reduction of microbial flora in the specific ICU. The scientific team of HCDI conducted also a financial study to monitor the positive impacts of the operation of this ICU. The results demonstrated a significant operating cost reduction at the ICU after the application



of antimicrobial copper, as a 35% drop of the consumption of antibiotics in the unit was noted during the respective control. **The world’s first Antimicrobial Copper plating at a neonatal ICU was completed in September 2012 at “Agia Sofia” Children’s Hospital of Athens.** In section B of the ICU of the hospital, the existing handles, knobs, push surfaces, touch surfaces, food trays as well as doctors and head nurses offices were replaced and plated with Antimicrobial copper. The results show the significant reduction of the microbial flora in the specific ICU.

The world’s first-ever industrial production and installation of antimicrobial copper air vents in a 3,000 sq.m.office space, located in Maroussi, Attica. 10 tones of copper were used for the development of a modern ventilation and air conditioning system of high aesthetics, that promotes a healthier working environment. The project was carried out as an initiative of the HCDI, aiming to create a model installation which would highlight the salutary value of clean air for the sustainability of a business, while adding an innovative touch to the design of the workplace. Even though infections at the workplace have not been scientifically proven yet, the impact of copper on bacteria found in ventilation and air conditioning systems is drastic.

The above applications realized in Greece, have been presented in global and Greek conferences and scientific papers have been issued respectively. In the References below, the major announcements are quoted.

Content Sources from:

www.antimicrobialcopper.com
www.epa.gov
www.copper.org.gr

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