

# King Plastic Corporation

## Technical Bulletin for King MicroShield™



### OVERVIEW

King MicroShield™ is a new kind of antimicrobial protection upgrade now available in many of King Plastic Corporation's polymer sheets, slabs and massive shapes. King MicroShield helps products stay cleaner between cleanings and inhibits the growth of product-damaging microorganisms, including bacteria, algae and fungi on the surface. Microbe cell walls that come into contact with King MicroShield are destroyed on contact, without creating opportunities for adaptive or resistant strains to form. Because the antimicrobial agent is bonded at the molecular level throughout the sheet, it will not leach out of the product. This means the agent retains its effectiveness throughout the life of the product and does not harm the environment. It is safe, non-toxic and non-hazardous to ship and handle. The product is EPA-registered and listed with the FDA as a modifier to medical devices. Products made using King Plastic Corporation's polymers with King MicroShield are easy to clean, disinfect and keep hygienic using standard cleaning procedures. Constant use of cleaning agents or solutions will not reduce the efficacy of any King Plastic polymer produced with King MicroShield.

### APPLICATIONS

- Medical Facilities
- Nursing Homes
- Dental Labs
- Pharmaceutical Labs
- Commercial/Medical Laboratories
- Clean Rooms
- Cold Storage
- Outdoor Kitchens
- Correctional Facilities
- Veterinary Facilities
- Animal Science Facilities
- Rest Rooms
- Locker Rooms
- Pool Areas
- Schools

	<i>King MicroShield™</i>	Silver-Based	Triclosan-Based
Common Names/Variants	King MicroShield	AgION A.M.Y. Meryl Skinlife and others	Amicor Tinosan Microban and others
Mode of Action	Physically ruptures the cell membrane	Releases ionic free radicals that react with cell DNA and disrupt the critical life processes in the cell	Releases toxic bischlorinated phenol (PBC) for consumption or cellular absorption, causing lethal mutations in the cell
Leaching: Bleeding onto the user, into the water, and into the environment	Does not leach Does not Migrate	Leaches for its mode of action. Must Leach to work.	Leaches for its mode of action. Must Leach to work.
Durability	Permanent	Service life 1-3 years	Service life 1-3 years
Cost	Economical	The cost of silver is high	Intermediate
Effectiveness	Broad spectrum on all known bacteria, fungi, algae, yeast and viruses	Action variable based on concentration and test or use conditions	Action variable based on concentration and test or use conditions
Adaptive Organisms	Does not to promote adaptive organisms (super bugs)	Can Create adaptive zones. Resistant species identified.	Can Create adaptive zones. Resistant species identified.
Log Reduction(1-6, 1 being the lowest, 6 being the highest)	4 on 24 hour test & 2 hour test	1-2 on a 24 hour test	2 on a 24 hour test
Distribution	World wide	Varies by company	Not accepted or available in certain areas of the world



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Whether you build, design, manage, or own facilities. You can provide your occupants with an additional level of protection by installing products treated with King MicroShield™.

King MicroShield is recommended to be added to the following materials:

### Architectural Products

King StarBoard® ST– Cabinets, Casegoods, Furniture, & more

King PlastiBal®– Lavatory and institutional partitions

King ColorCore®– Engravable sheet for signage, locker, partitions & more

King ColorBoard®– Solid sheet for signage, lockers, partitions, & more

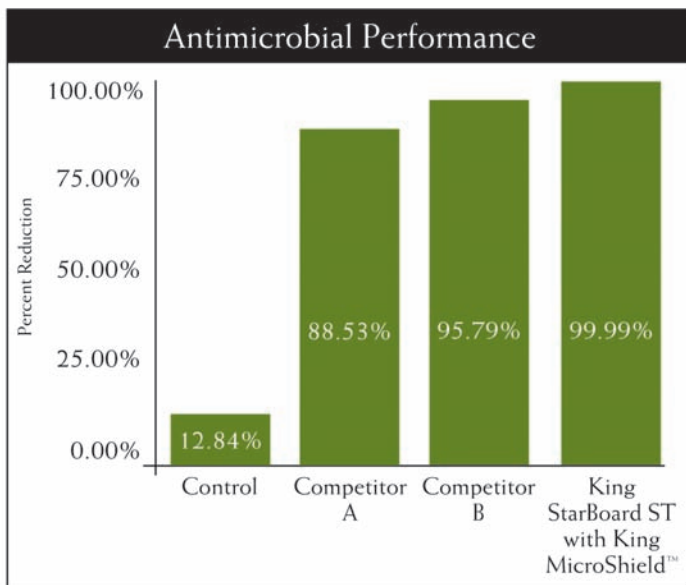
### Marine Products

King StarBoard®– The ultimate Marine Building Material

King StarBoard® XL– Lightweight, Cellular Marine-Grade

King StarBoard® AS– Slip-resistant top surface

King StarLite® XL– Cellular utility sheet



#### Notes:

- Test Method: ASTM E2149
- Test performed by Antimicrobial Test Laboratories LLC, an independent testing lab.



Ideal for medical cabinetry



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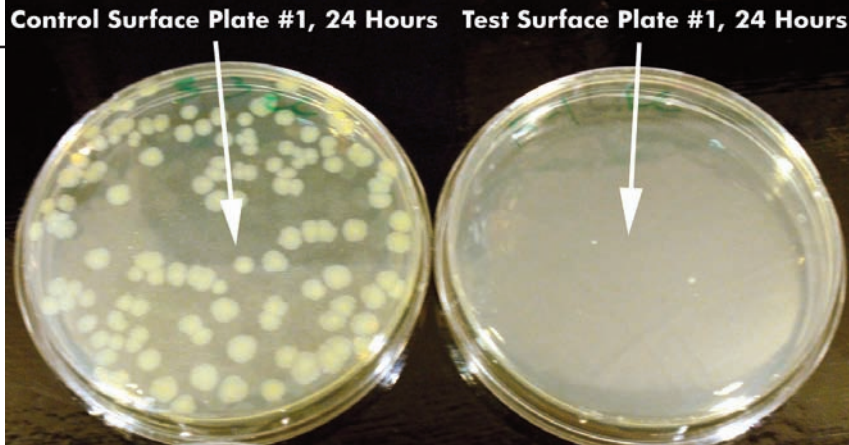
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### ANTIMICROBIAL EFFICACY\*

24-hour E. coli test

- Bacteria**
- Micrococcus sp.
  - Xanthomonas campestris
  - Mycobacterium smegmatis
  - Pseudomonas aeruginosa PDR-10
  - Staphylococcus epidermidis
  - Haemophilus influenzae
  - Mycobacterium tuberculosis
  - Streptococcus faecalis
  - Enterobacter agglomerans
  - Haemophilus suis
  - Brucella cania
  - Escherichia coli ATCC 23266
  - Acinetobacter calcoaceticus
  - Lactobacillus casei
  - Brucella abortus
  - Staphylococcus aureus (pigmented)
  - Brucella suis
  - Staphylococcus aureus (non-pigmented)
  - Streptococcus mutans
  - Klebsiella pneumoniae ATCC 4352
  - Bacillus subtilis
  - Pseudomonas aeruginosa
  - Bacillus cereus
  - Pseudomonas aeruginosa
  - Clostridium perfringens
  - Corynebacterium bovis
  - Salmonella choleraesuis



- Escherichia coli
- Leuconostoc lactis
- Proteus mirabilis
- Listeria monocytogenes
- Proteus mirabilis
- Propionibacterium acnes
- Citrobacter diversus
- Proteus vulgaris
- Shigella dysenteriae
- Campylobacter jejuni
- Salmonella typhosa
- Pseudomonas cepacia
- Pseudomonas fluorescens

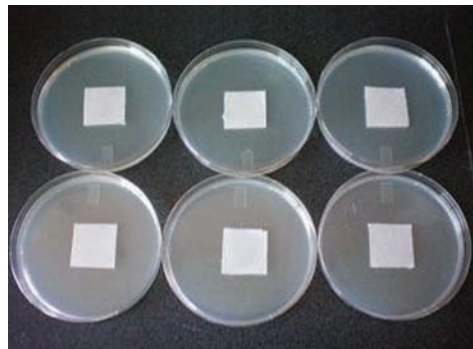
- Algae**
- Oscillatoria borneti LB143
  - Anabaena cylindrica B-1446-1C
  - Selenastrum gracile B-325
  - Pleurococcus sp. LB11

- Schedesmus quadricauda
- Gonium sp. LB 9c
- Volvox sp. LB 9
- Chlorella vulgaris

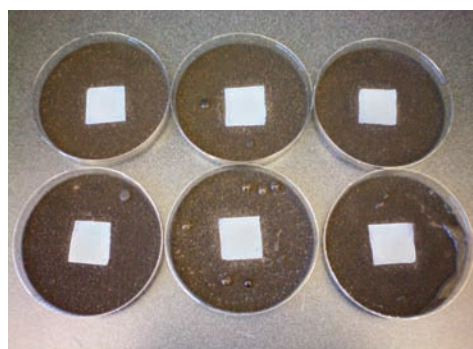
- Fungi**
- Aspergillus niger
  - Aspergillus fumigates
  - Aspergillus versicolor
  - Aspergillus flavus
  - Aspergillus terreus
  - Penicillium chrysogenum
  - Penicillium albicans
  - Penicillium citrinum
  - Penicillium elegans
  - Penicillium funiculosum
  - Penicillium humicola
  - Penicillium notatum
  - Penicillium variabile

- Mucor sp.
- Tricophyton mentagrophytes
- Tricophyton interdigitale
- Trichoderma flavus
- Chaetomium globosum
- Rhizopus nigricans
- Cladosporium herbarum
- Aerobasidium pullulans
- Fusarium nigrum
- Fusarium solani
- Gladiadium roseum
- Oospora lactis
- Stachybotrys atra

Mold Test ASTM G21 Day 0



Day 21



Mold growing in agar, but not on the treated polyethylene

\*Representative sample of microbes tested to date. Samples may be provided for customer-specific testing if required.

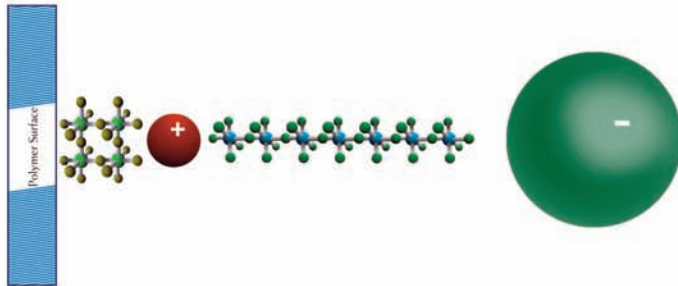


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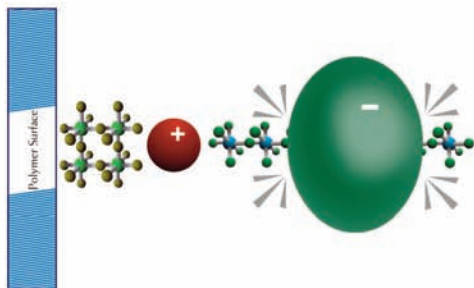
### HOW IT WORKS



Base permanently bonds to the polymer

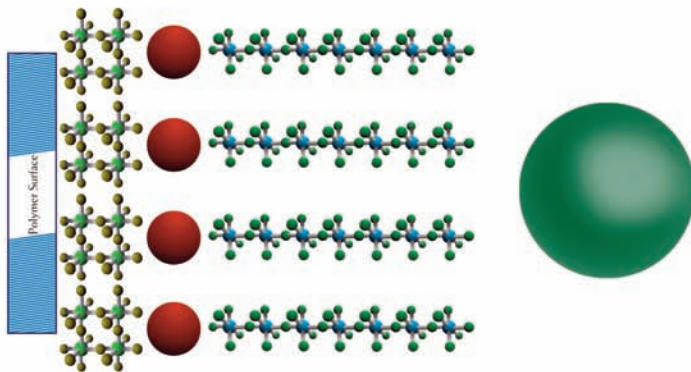
Positively charged atom attracts the negatively charged microbe

Microbe has negatively charged cell membrane



Long molecular chain punctures like a sword

If the microbe survives the initial puncture, it is electrocuted and blown apart by contact with the positive charge



Antimicrobial is present throughout the entire sheet or consistent, lifetime performance



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