

85249-1

12/01/2011

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Pesticide Programs
Antimicrobials Division (7510P)
1200 Pennsylvania Avenue NW
Washington, D.C. 20460

EPA Reg.
Number:

85249-1

Date of
Issuance:

December 1,
2011

Term of Issuance:

Conditional

Name of Pesticide Product:

HeiQ AGS-20

NOTICE OF PESTICIDE:

Registration
 Reregistration

(under FIFRA, as amended)

Name and Address of Registrant (include ZIP Code):

HeiQ Materials AG
Zürcherstrasse 42
CH-5330 Bad Zurzach
Switzerland

Note: Changes in labeling differing in substance from that accepted in connection with this registration must be submitted to and accepted by the Registration Division prior to use of the label in commerce. In any correspondence on this product always refer to the above EPA registration number.

On the basis of application and information furnished by the registrant, the above named pesticide is hereby registered/reregistered under the Federal Insecticide, Fungicide and Rodenticide Act. Registration is in no way to be construed as an endorsement or recommendation of this product by the Agency. The acceptance of any name in connection with the registration of a product under this Act is not to be construed as giving the registrant a right to exclusive use of the name or to its use if it has been covered by others.

This product (OPP Decision No. 400227) is registered in accordance with FIFRA sec 3(c)(7)(C). The conditions on the registration of this product are provided in the enclosed Appendix A.

Signature of Approving Official:

Marshall Swindell
Product Manager 33
Regulatory Management Branch I
Antimicrobials Division (7510P)

Date:

DEC 1 2011

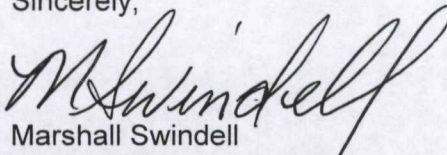
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This letter constitutes EPA authorization to distribute HeiQ AGS-20 consistent with the terms and conditions specified in the enclosed Appendix A.

A stamped copy of the label is enclosed for your records. Should you have any questions regarding this letter, please contact me either by phone at (703) 308-6341 or email at swindell.marshall@epa.gov or Demson Fuller by phone at (703) 308-8062 or email at fuller.demson@epa.gov.

Sincerely,



Marshall Swindell
Product Manager Team 33
Regulatory Management Branch I
Antimicrobials Division (7510P)

Enclosures (2)

1. Appendix A - Data Requirements, Enforceable Schedule, and Conditions of Registration for HeiQ AGS-20
2. Stamped Label

**Appendix A –
Data Requirements, Enforceable Schedule, and
Conditions of Registration for HeiQ AGS-20**

December 1, 2011

I. Introduction

AGS-20 is a silver-silica composite that contains nanosilver sintered onto amorphous silicon dioxide (SiO_2). The SiO_2 fine structure consists of aggregate matrix particles with an average diameter of approximately 1,000 nm or 1 micron. Each silica particle contains many small silver metal particles with a typical diameter between 1 and 10 nm (Egger et al., 2009) and some particles in the 50 nm range. Reference to the nanosilver in AGS-20 (whether when part of the composite or when broken away from the composite) is to the “new active ingredient” and reference to “AGS-20” or the AGS-20 “composite” is to the end use product.

II. Exposure Pathways

The human and environmental exposures resulting from the use of AGS-20, and use and disposal of textiles treated with AGS-20 will largely be a function of what materials are available for inhalation or dermal exposure during treatment of textiles or what materials leach or break away from the treated textile during use and disposal. EPA anticipates that humans and the environment will potentially be exposed to the following materials:

1. AGS-20 nanosilver-silica composite particles;
2. Silver nanoparticles that break away from AGS-20 nanosilver-silica composite particles;
and
3. Silver ions released from AGS-20 nanosilver-silica composite particles.

EPA expects occupational inhalation and dermal exposures to AGS-20 are likely to occur during the following use scenarios:

1. Mix, load, and apply AGS-20 powder during the treatment of textiles
2. Preparing textile articles from AGS-20 treated textiles
3. Laundering AGS-20 treated textiles

Based on the AGS-20 product use patterns as shown in Figure 1A, the following consumer exposure scenarios may be possible for AGS-20 treated textiles:

1. Inhalation exposure during laundry drying of AGS-20 treated fabrics;
2. Incidental oral exposure to AGS-20 treated fabrics; and
3. Dermal exposure while wearing AGS-20 treated fabrics.

Exposures to the environment can also occur if the particles are released into wash water (down-the-drain).

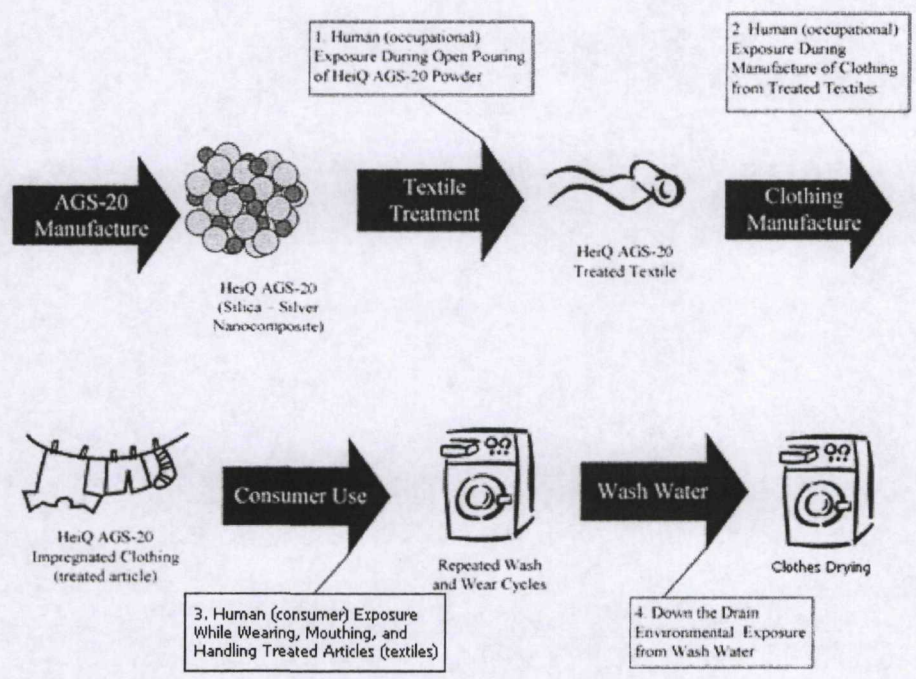


Figure 1A – Product Use Analysis for HeiQ AGS-20

III. Data Needed to Confirm the Estimates for Risks of Exposure to AGS-20

As a condition of registration, EPA is requiring the HeiQ to conduct a number of studies, based on a tiered approach, which will allow the Agency to confirm the findings of the risk assessment completed for the conditional registration and discussed in the decision document. These tests include route-specific toxicity studies for occupational, residential, and environmental exposure scenarios. Data must be submitted within four years and according to the schedule provided in Table 3A to avoid cancellation of the conditional registration. The duration of four years was chosen to allow time for protocol reviews prior to initiation of the studies, completion of the studies, and Agency review of the studies following completion. The Agency will evaluate these data as they are submitted during the period of the conditional registration to confirm the Agency’s determination that the product is not expected to cause unreasonable adverse effects to human health and the environment. If EPA determines that HeiQ has failed to take appropriate steps to initiate the required studies, or failed to submit the protocols or studies, as required pursuant to this Appendix , EPA will issue a notice of intent to cancel HeiQ’s registration under FIFRA section 6(e). Upon review of the data submitted, if EPA determines there is a risk of concern notwithstanding the terms and conditions on this conditional registration, HeiQ will need to propose risk mitigation measures to avoid potential cancellation of this registration under FIFRA section 6(b).

The following factors were considered in developing the data requirements for AGS-20:

- The AGS-20 nanosilver is a new active ingredient and is therefore subject to the data requirements for the registration of antimicrobial pesticides that are detailed in 40 CFR Part 161. These requirements include studies on physical and chemical characteristics,

residue chemistry, environmental fate, toxicology, reentry protection, spray drift, wildlife and aquatic organisms, plant protection, nontarget insects, and product performance.

- Although some studies, such as those dealing with physical and chemical characteristics, are required for all use patterns, many of the data requirements are conditional based on the use pattern. Information provided by HeiQ and information from the literature was used to tailor the data requirements to the proposed use pattern.
- Additional studies in the area of physical and chemical characterization that are not specifically included in 40 CFR Part 161 are needed because AGS-20 contains nanosilver. These studies are needed because nanosized materials may have unique and new characteristics which are not present in the bulk or conventional materials. These characteristics have been recognized in the FIFRA SAP Report (FIFRA SAP, 2009) and by the MINChar Initiative (2008).

In addition, the following recommendations from the FIFRA SAP report were considered in the development of the data requirements as terms and conditions on the conditional registration of AGS-20:

- Both nano-sized particles of silver (Ag) as well as ionic silver (Ag⁺) can contribute to toxic effects of nanosilver. The rate of silver ion production, as well as the distribution of nanosilver in tissues and the environment, may differ substantially between nanosilver and other forms of silver, as nanosilver can potentially deliver silver ions directly to specific tissues, cell membranes or inside cells – places where other forms of silver compounds cannot reach. Therefore, the hazard profile of nanosilver may differ from other forms of silver.
- Particle size can substantially impact particle properties, such as rate and concentration of silver ion release, reactivity and catalytic efficiency, plasmon resonance, and quantum effects. Smaller sized-particles are more easily taken up by organisms and are distributed more widely. Other physicochemical properties, such as shape, surface area, surface charge or coating, are also likely to impact biological response and environmental fate.
- The Panel “disagreed that nanosilver applied to a substrate will permanently bind with the substrate.” It is “especially challenging to determine that there is no release of nanomaterials from a substrate” under current state of science and available measurement standards. The Panel suggested that the Agency require tests that simulate realistic use of products and potential nanosilver release along with quantitative life-cycle analysis and risk assessment.

A listing of the studies that are needed for the registration of AGS-20 is included in Tables 1A and 2A. The studies included in Table 1A are considered to be Tier I, meaning that their need is not based on the results of other studies. The studies listed in Table 2A are considered to be Tier II, because they may or may not be required depending upon the results of the Tier I studies. The AGS-20 composite and textiles treated with AGS-20 will be the test material during Tier I studies and the test material for Tier II studies will depend on the results of the Tier I leaching

and dissolution studies. Figure 2A contains a conceptual diagram outlining the Tier I and Tier II testing approach.

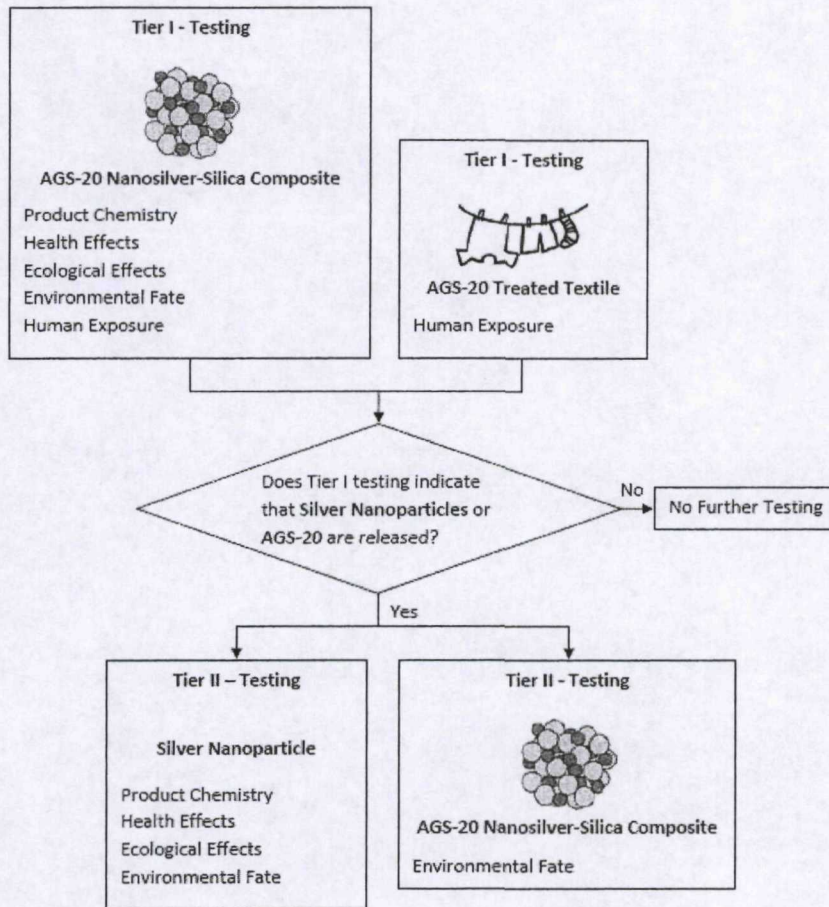


Figure 2A - Test material and tiered approach for AGS-20. Only the testing category is shown; see Tables 1A and 2A for the specific tests required for each material.

IV. NonData-Related Terms and Conditions of Registration

Consistent with HeiQ’s original and amended applications, HeiQ is required to state on the pesticide label that the application rates must be less than 100 ppm (mg/kg) or 0.01% silver on a weight basis for textile fibers which incorporate AGS-20 and less than 20 ppm (mg/kg) or 0.002% for textiles surface coated with AGS-20.

1. HeiQ is required to state on the pesticide label that workers who handle the AGS-20 powder shall wear the following personal protective equipment (PPE): Gloves that are chemically resistant to all of the components of the textile fiber master batch or coating formulations to which the AGS-20 powder is added.
2. A long-sleeve shirt, long pants, shoes plus socks, and overalls or a Tyvek® suit that cover the arms, legs and torso.

NIOSH certified full-face respirators with P100 or equivalent filter cartridges. In addition to the PPE listed above, AGS-20 shall be applied in facilities equipped with engineering controls such as closed system loading or local exhaust ventilation systems that provide, at the least, a 10 fold reduction in the concentration of airborne AGS-20 as compared to the AGS-20 concentration generated without engineering controls. AGS-20 cannot be applied using open pouring methods.

V. Enforceable Schedule

HeiQ agrees to take appropriate steps to secure the data listed in Tables 1A and 2A. As such, EPA has prepared an enforceable schedule that is presented in Table 3A. This schedule is an estimation of the time required for developing and submitting protocols for review, conducting the studies, and submitting the resulting data, as well as EPA’s review of the submitted data. However, unforeseen technical issues may arise due to the unique nature of AGS-20 (a difficult-to-test substance), which may cause a delay in testing. If such a case arises, HeiQ shall submit a written request justifying the nature of the delay. In addition to technical delays, there may be delays by EPA in reviewing protocols and data submitted by HeiQ. In this case, the EPA shall submit a written statement to HeiQ outlining the nature of the delay. In either case, if EPA determines a delay in the enforceable schedule is appropriate, it will amend the terms and conditions on the conditional registration.

Notwithstanding technical delays or delays in reviewing data, if HeiQ fails to take appropriate steps to initiate the required studies, or fails to submit the protocols or data, as required pursuant to this Appendix, EPA will issue a notice of intent to cancel HeiQ’s registration under FIFRA section 6(e). Specifically, HeiQ shall:

1. Submit protocols modified for AGS-20 to EPA’s satisfaction for each of the data requirements listed in Table 1A.
2. Perform each test and submit the results from each test as described in Table 1A and 2A.

These items shall be submitted according to the schedule provided in Table 3A. If EPA determines that HeiQ has failed to initiate or to submit the required studies by the dates indicated in Table 3A, then EPA will issue notice of intent to cancel HeiQ’s registration under FIFRA section 6(e).

EPA will use this data to confirm EPA’s determination that the conditional registration of AGS-20 will not cause unreasonable adverse effects on the environment, taking into account the terms and conditions on the registration.

References:

Egger, S., Lehmann, R.P., Height, M.J., Loessner, M.J., Schuppler, M. 2009. Antimicrobial Properties of a Novel Silver-Silica Nanocomposite Material. *Applied and Environmental Microbiology* 75:2973-2976. (MRID 477575-03)

FIFRA SAP, 2009. FIFRA Scientific Advisory Panel Meeting held November 3 - 5, 2009 on the Evaluation of Hazard and Exposure Associated with Nanosilver and Other Nanometal Pesticide Products *Available at:*

<http://www.epa.gov/scipoly/sap/meetings/2009/november/110309ameetingminutes.pdf>

The Minimum Information for Nanomaterial Characterization (MINChar) Initiative, 2008.

Available at: <http://characterizationmatters.files.wordpress.com/2008/11/minchar-parameters-list.pdf>

Table 1A - Summary of Tier I Required Data for HeiQ AGS-20

OSCPP Data Requirement (Note 1) Guideline Number: Study Title	Reason for Study	Test Material	Comments
Product Chemistry			
830.1550: Product Identity and Composition		AGS-20	The topology of the nanocomposite needs to be fully described. Information is needed on how nanosilver is bound to and distributed on the silica matrix.
830.1750: Certified Limits		AGS-20	The submitted study only provides data on the average amount of nanosilver present in AGS-20. Data are also needed on the upper and lower limits of nanosilver present in AGS-20.
830.1800: Enforcement Method		AGS-20	Submitted method is based on analysis of total silver. Need method to include high resolution images of the nanosilver.
830.1900: Submittal of Samples		AGS-20	EPA is requiring samples for independent testing and confirmation of HeiQ test results.
830.6313: Stability to Normal and Elevated Temperatures, and Metals/Metal Ions	Required for antimicrobial pesticides per 40 CFR 161.	AGS-20	Also need to test stability to sunlight, detergents, and salinity. The results of these tests will dictate the test substance for the Tier II studies.
830.6317: Storage Stability		AGS-20	Originally submitted studies were not acceptable because they used an accelerated method. HeiQ is currently conducting one year studies.
830.6320: Corrosion Characteristics		AGS-20	UV-Vis data will be used to confirm that the material is in fact nano-sized. It may also provide data on the range of particle sizes of the nanosilver particles in AGS-20.
830.7050: UV-Visible Light Adsorption		AGS-20	Submitted data for pH 7. Need data for pH 5 and 9.
830.7840: Solubility		AGS-20	A literature study (Egger et al., 2009) provides some particle size and surface area data; however, it does not have the quality control information and documentation that is required for a product chemistry study.
Non-Guideline: Particle Size and Diameter (size) Distribution	Required to characterize product.	AGS-20	
Non-Guideline: Surface Area Determination	Required to characterize product.	AGS-20	

Table 1A - Summary of Tier I Required Data for HeiQ AGS-20

OSCPP Data Requirement (Note 1) Guideline Number: Study Title	Reason for Study	Test Material	Comments
Human Exposure			
875.1200 and 875.1400: Applicator, Indoor Exposure	Required to confirm assessment on occupational handler exposure during pouring of powder.	AGS-20	This study will provide EPA with information useful for evaluating the form, route, and level of exposure experienced by workers who handle AGS-20 powder in the process of treating textiles. The exposure data will be used in conjunction with the toxicology endpoints to confirm the Agency's evaluation of the risk of applicator exposure to AGS-20 powder. This risk assessment will be used to determine what, if any, further mitigation measures may be necessary to prevent adverse health effects in exposed workers.
Non-Guideline: Attrition Study	Required to confirm assessment on consumer and occupational exposure during laundry drying of AGS-20 treated textiles.	AGS-20 Treated Textiles	This study will provide EPA with information useful for evaluating the form, route, and level of exposure to silver experienced by consumers and workers based on the lint produced during drying of AGS-20 treated textiles.
Non-Guideline: Textile Leaching Study (Confirm Geranio et al., 2009 study results)	Required to confirm assessment on human and environmental exposure. This test will determine what test substance will be used for Tier II studies.	AGS-20 Treated Textiles	A leaching study is needed to determine if materials other than silver ions are released from AGS-20 treated textiles under conditions of use. HeiQ has submitted both a leaching study they conducted and a leaching study from the literature (Geranio et al., 2009). HeiQ claims that these studies indicate that only silver ions were released from the AGS-20 or textiles treated with AGS-20. EPA has reviewed these studies and determined they do not support HeiQ claims of no silver nanoparticle release. An additional, follow-up leaching study is needed and this study could be done in the manner of Geranio et al. (2009) ISO wash-test with the addition of electron microscopy to characterize the particulate that is found to be released. The exposure data will be used in conjunction with the toxicology endpoints to confirm the Agency's evaluation of the risk of exposure to AGS-20.

Table 1A - Summary of Tier I Required Data for HeIQ AGS-20

OSCPP Data Requirement (Note 1) Guideline Number: Study Title	Reason for Study	Test Material	Comments
Health Effects			
870.3465: 90-Day Inhalation Toxicity (Rat) (Replace Sung et al., 2009 study results) Modified to include <i>in vivo</i> bone marrow assay and functional observational battery, motor activity and detailed neuropathology	Conditionally Required for antimicrobial pesticides per 40 CFR 161.340 (Required if use results in repeated inhalation exposure) Occupational inhalation exposures to AGS-20 powder are anticipated during textile manufacturing and processing.	AGS-20	The inhalation study is a route-specific study and is more appropriate than a subchronic oral toxicity study. Inhalation studies of shorter duration (e.g. acute inhalation studies or repeated exposure inhalation studies less than 90 days) would not be sufficient to identify health effects such as pulmonary fibrosis, which has been observed with other nanoparticles, and which takes several months to develop. Guideline modified to include <i>in vivo</i> bone marrow assay and functional observational behavioral battery, motor activity and detailed neuropathology.
870.3250: 90-Day Dermal Toxicity (Rat) (Replace DAF of 0.1% and Park et al. 2010 study results)	Conditionally Required for antimicrobial pesticides per 40 CFR 161.340 (Required if human exposure via skin occurs) Occupational dermal exposures to AGS-20 are anticipated during textile manufacturing and processing.	AGS-20	A 90 day dermal toxicity study is needed to assess the risks of these exposures. The dermal toxicity study is route-specific, and is more appropriate than a subchronic toxicity study via another route (e.g. oral). The use of studies via other routes requires dermal penetration studies to estimate dermal absorption.
Modified 870.3550/ OECD TG 421: Reproduction/Developmental Toxicity Screening Test	Conditionally Required for antimicrobial pesticides per 40 CFR 161.340 (Required for non-food use products resulting in human exposure over significant portion of human lifespan) Occupational exposure to workers of reproductive age. Required for antimicrobial pesticides per 40 CFR 161.340.	AGS-20	The combined repeated-dose toxicity study with the reproduction/developmental toxicity screening test will provide initial information on possible effects on reproduction and/or development. In addition, the study may also provide a toxicity endpoint applicable to a risk assessment for oral incidental exposure.
Non-Guideline: <i>in vitro</i> micronucleus (MN) assay	Nanosilver known to generate radical oxygen species which can induce genetic mutations.	AGS-20	Genetic toxicity tests are used to screen chemicals for mutagenic or carcinogenic potential. The data from this test will be used to determine if AGS-20 is a potential mutagen or carcinogen.

Table 1A - Summary of Tier I Required Data for HeIQ AGS-20

OSCPP Data Requirement (Note 1) Guideline Number: Study Title	Reason for Study	Test Material	Comments
Ecological Effects			
850.2100: Avian Acute Oral Toxicity	Required for labeling when shipping AGS-20.	AGS-20	These data are required for labeling packages which contain AGS-20 for shipment.
850.1010: Aquatic Invertebrate Acute Toxicity, Freshwater Daphnids			
850.1075: Fish Acute Toxicity Test, Freshwater and Marine			
Environmental Fate			
Non-Guideline: Dissolution Kinetics Study	Required to assess environmental exposure from wash water.	AGS-20	This is a primary study on the persistence of AGS-20 in the environment and the extent of silver ion or nanoparticle release. This test will dictate the test substance to be used for the Tier II studies.

Table 2A - Summary of Tier II Required Data for HeIQ AGS-20

OSCPP Data Requirement (Note 1) Guideline Number: Study Title	Reason for Study	Test Material	Comments
Product Chemistry			
830.7050: UV-Visible Light Adsorption	These studies are required to characterize the nanosilver if released during Tier I stability, dissolution or leaching studies.	Nanosilver	
Non-Guideline: Particle Size and Diameter (size) Distribution			
Non-Guideline: Surface Area Determination			
830.7840: Solubility			
Non-Guideline: Zeta Potential and Surface Charge Determination			
Human Exposure – No Tier II Studies are Required			
Health Effects			
870.3100: 90-Day Oral Toxicity (Rat) (Replace Park et al. 2010 study results)	Residential incidental oral exposure to nanosilver.	Nanosilver	The oral study is a route-specific study required to evaluate the effects of ingesting nanosilver from incidental oral exposures.
870.3250: 90-Day Dermal Toxicity (Rat) (Replace DAF of 0.1% and Park et al. 2010 study results)	Occupational dermal exposures to nanosilver are anticipated during AGS-20 treated textile manufacturing and processing. Consumer dermal exposures to nanosilver are anticipated while wearing and mouthing AGS-20 treated textiles.	Nanosilver	A 90 day dermal toxicity study is needed to assess the risks of the exposures to nanosilver if released from AGS-20 treated textiles during Tier I studies. The dermal toxicity study is route-specific, and is more appropriate than a subchronic toxicity study via another route (e.g. oral). The use of studies via other routes requires dermal penetration studies to estimate dermal absorption.

Table 2A - Summary of Tier II Required Data for HeIQ AGS-20

OSCPP Data Requirement (Note 1) Guideline Number: Study Title	Reason for Study	Test Material	Comments
Modified 870.3550/ OECD TG 421: Reproduction/Developmental Toxicity Screening Test	Children's exposure to nanosilver while wearing and mouthing AGS-20 treated textiles. Occupational exposure to nanosilver for workers of child bearing age.	Nanosilver	The combined repeated-dose toxicity study with the reproduction/developmental toxicity screening test will provide initial information on possible effects to reproduction and/or the developmental effects if nanosilver is released from treated textiles in Tier I studies. In addition, the study may also provide a toxicity endpoint applicable to a risk assessment for oral incidental exposure.
Non-Guideline: <i>in vitro</i> micronucleus (MN) assay	Nanosilver is known to generate radical oxygen species which can induce genetic mutations.	Nanosilver	Genetic toxicity tests are used to screen chemicals for mutagenic or carcinogenic potential. The data from these tests will be used to determine if the nanosilver released from the AGS-20 in Tier I studies is a potential mutagen or carcinogen.
Ecological Effects			
850.1850: Modified Aquatic Food Chain Transfer	Required to determine bioavailability and biomagnifications.	See Note 2	Traditionally use Fish and Oyster BCF to estimate bioaccumulation for chemicals, however, mesocosm tests more likely to yield useful information.
850.4100: Terrestrial Plant Toxicity	Required to determine effects to plants during early critical stages in their development.	See Note 2	Nanosilver is likely to partition to biosolids during wastewater treatment. If those biosolids are then used in land farming, nanosilver may impact growth of plants in farm fields.
850.4400: Aquatic Plant Toxicity, Tier 2	Required to determine the toxicity to freshwater and aquatic plants.	See Note 2	Aquatic plants are the primary source of cellular carbon and chemical energy for aquatic environments. Impacts to these primary producers would have broad implications for the aquatic food chain.
850.5400: Algal Toxicity, Tier 2	Required to determine the phytotoxicity to freshwater and marine algae.	See Note 2	Algae are the primary source of cellular carbon and chemical energy for aquatic environments. Impacts to these primary producers would have broad implications for the aquatic food chain.
Non-Guideline: Measuring the Chronic Effects of Freshwater Sediment-Associated Contaminants on <i>Chironomus dilutes</i>	Required to determine chronic impact to freshwater sediment dwelling organisms.	See Note 2	Silver nanoparticles if released into aquatic environments are likely to partition to sediment. Chronic tests on a freshwater benthic emergent insect (<i>Chironomus dilutes</i> , formerly <i>Chironomus tentans</i>) with epibenthic ecological niche will be used to estimate potential risks to freshwater benthic organisms.
Non-Guideline: Measuring the Chronic Effects of Freshwater Sediment-Associated Contaminants on <i>Hyalella azteca</i>	Required to determine chronic impact to freshwater sediment dwelling organisms.	See Note 2	Silver nanoparticles if released into aquatic environments are likely to partition to sediment. Chronic tests on a freshwater benthic amphipod (<i>Hyalella azteca</i>) with infaunal ecological niche will be used to estimate potential risks to freshwater benthic organisms.
Non-Guideline: Measuring the Chronic Effects of Marine and Estuarine Sediment-Associated Contaminants on <i>Leptocheirus plumulosus</i>	Required to determine chronic impact to marine sediment dwelling organisms.	See Note 2	Silver nanoparticles if released into aquatic environments are likely to partition to sediment. Chronic tests on an estuarine/marine benthic amphipod (<i>Leptocheirus plumulosus</i>) will be used to estimate potential risks to marine benthic organisms.

Table 2A - Summary of Tier II Required Data for HeiQ AGS-20

OSCPP Data Requirement (Note 1) Guideline Number: Study Title	Reason for Study	Test Material	Comments
Environmental Fate			
Non-Guideline: Rate of Deposition	The rates of aggregation and sedimentation are required for confirming estimates on the environmental fate and potential ecological impacts of these materials.	See Note 2	Knowing the rate of aggregation and sedimentation of the products released from textiles would give primary information on the behavior of these compounds in the aquatic environment.
835.1100: Activated Sludge Sorption Isotherm	Required to determine wastewater treatment removal efficiency.	See Note 2	The EPA uses Guideline 835.1110 test results to estimate the removal efficiency of a chemical as it passes through a wastewater treatment plant.
835.1230: Adsorption/Desorption (Batch Equilibrium)	Required to determine partitioning to solids.	See Note 2	If the material is removed during wastewater treatment, it may be deposited on land through the deposition of sludge (i.e. land farming). If the material is not removed during wastewater treatment it may be released into aquatic environments and may bind to sediment. Adsorption/desorption equilibrium studies required to determine the mobility of AGS-20 or nanosilver in the environment.
835.1240: Leaching Studies (Soil Column Tests)	Required to determine the mobility in subsurface environment.	See Note 2	The distance that nanoparticles move in soil and groundwater is thought to depend on interaction with soil grains. Attachment of nanoparticles to soil grains depends on the physical processes of sedimentation, interception, and diffusion rather than partitioning to natural organic matter. Nanoparticle to soil grain interaction depends on nanoparticle diameter, aqueous chemistry, and the arrangement of soil grains and must be measured using soil column tests.
850.6800: Modified Activated Sludge, Respiration Inhibition Test for Sparingly Soluble Chemicals (Confirm HeiQ screening study)	Required to determine impact to wastewater treatment systems.	See Note 2	Silver from industrial processes (e.g., film processing) has been shown to reduce microbial activity in wastewater treatment systems. The purpose of the study is to assess the impact of AGS-20 or nanosilver on microbial activity during wastewater treatment.

Note 1: These guidelines only provide general guidance. Protocols shall be submitted prior to conducting these studies.

Note 2: The test material shall include materials that are released during the stability, dissolution/dispersability, and textile leaching studies. These materials include the AGS-20 composite and/or nanosilver released from the AGS-20 composite.

Table 3A – Enforceable Schedule

The AGS-20 composite and textiles treated with AGS-20 will be the test material during Tier I studies. EPA anticipates that data will be developed in a phased approach. Thus, the schedule is separated into phases where Phase 1 – Product Characterization and Phase 2 – Product Testing will occur prior to developing protocols for Phase 3 – Release Characteristics/Exposure, Phase 4 – Health Effects, and Phase 5 – Ecologic Effects.

Tier I: AGS-20 and AGS-20 Treated Textile Testing

Guideline	Phase 1 – Product Characterization	Prepare and Submit Protocols*	Perform Study and Submit Results*
Non-Guideline	Particle Size Distribution	Q1[†] 2012	Q1 2012
Non-Guideline	Surface Area		
	Phase 2 – Product Testing	Q1 2012	Q2 2012
830.6313	Stability		
830.6320	Corrosion Characteristics		
830.7050	UV-Vis		
830.7840/7860	Solubility		
	Phase 3 – Release Characteristics/Exposure	Q3 2012	Q4 2012 - Q1 2013
Non-Guideline	Dissolution Kinetics		
Non-Guideline	Leaching Test of Textile		
875.1200	Dermal Exposure-Indoor		
875.1400	Inhalation Exposure-Indoor		
Non-Guideline	Attrition Test - Laundry Drying		
	Phase 4 – Health Effects	Q4 2012 – Q3 2013	Q4 2013 – Q3 2014
870.3465	90-Day Inhalation		
870.3250	90-Day Dermal Toxicity		
870.3550/ OECD 421	Reproduction/Developmental Toxicity Screening Test		
Non-Guideline	<i>in vitro</i> micronucleus (MN) assay		
	Phase 5 - Ecologic Effects	Q2 – Q3 2013	Q4 2013 – Q1 2014
850.2100	Avian Acute Oral Toxicity		
	Aquatic Invertebrate Acute Toxicity,		
850.1010	Feshwater Daphnids		
	Fish Acute Toxicity Test, Freshwater		
850.1075	and Marine		

*Submissions are due at end of quarter unless otherwise noted.

[†]Q1- Jan thru March; Q2 - April thru June; Q3 - July thru September; Q4 - October thru December

Table 3A – Enforceable Schedule

The test material for Tier II studies will depend on the results of the Tier I leaching and dissolution studies. EPA anticipates that data will be developed in a phased approach. Thus, the schedule is separated into phases where Phase 6 – Characterization will occur prior to developing protocols for Phase 7 – Health Effects, Phase 8 – Ecological Effects, and Phase 9 – Environmental Fate.

Tier II: Testing for Nanosilver and /or AGS-20 Released during Tier I Tests

Guideline	Phase 6 – Characterization	Prepare and Submit Protocols* Q2 2013[†]	Perform Study and Submit Results* Q3 2013
830.7050	UV-Vis		
Non-Guideline	Particle Size Distribution		
Non-Guideline	Surface Area		
830.7840/7860	Solubility		
Non-Guideline	Zeta-potential		
	Phase 7 - Health Effects	Developed during Phase 4	Q4 2013 – Q3 2014
870.3100	90-Day Oral Toxicity		
870.3250	90-Day Dermal Toxicity		
870.3550	Modified Reproduction/Developmental Toxicity Screening Test		
Non-Guideline	in vitro micronucleus (MN) assay		
	Phase 8 – Ecological Effects	Q3 - Q4 2013	Q1 – Q3 2014
850.1850	Modified Aquatic Food Chain Transfer		
850.4100	Terrestrial Plant Toxicity, Seedling Emergence		
850.4400	Aquatic Plant Toxicity, Tier II		
850.5400	Algal Toxicity, Tier II		
Non-Guideline	Measuring the Chronic Effects of Freshwater Sediment-Associated Contaminants on <i>Chironomus dilutes</i>		
Non-Guideline	Measuring the Chronic Effects of Freshwater Sediment-Associated Contaminants on <i>Hyalella azteca</i>		
Non-Guideline	Measuring the Chronic Effects of Marine and Estuarine Sediment-Associated Contaminants on <i>Leptocheirus plumulosus</i>		
	Phase 9 – Environmental Fate	Q3 – Q4 2013	Q1 – Q3 2014
Non-Guideline	Rate of Deposition		
850.1100	Activated Sludge Sorption Isotherm		
835.1230	Adsorption/Desorption		
835.1240	Leaching Studies (Soil Column Tests)		
850.6800	Modified Activated Sludge, Respiration Inhibition Test for Sparingly Soluble Chemicals		

*Submissions are due at end of quarter unless otherwise noted.

[†]Q1- Jan thru March; Q2 - April thru June; Q3 - July thru September; Q4 - October thru December

18/20

HeiQ[®] AGS-20

An antimicrobial additive designed to withstand high temperatures in the manufacture of yarns, filaments, fibers, fiber masterbatches, textile finishes, textile coatings and knitted, woven or nonwoven textile fabrics. Intended for commercial and industrial use, in manufacturing, formulating and fabricating of treated article products specified in the use directions.

Active Ingredient: Silver *	EPA Letter Dated:	19.3 %
Other ingredients	DEC 1 2011	80.7 %
TOTAL:		100.0 %

* includes particles in the size range between 1 to 100 µm

KEEP OUT OF REACH OF CHILDREN

CAUTION

85249-1

PRECAUTIONARY STATEMENTS

HAZARD TO HUMANS AND DOMESTIC ANIMALS

Causes moderate eye irritation. Harmful if inhaled, swallowed, or absorbed through skin. Avoid breathing dust. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

WORKER PROTECTION

Workers who mix, load, and apply (i.e., handling) HeiQ[®] AGS-20 powder shall do so using engineering controls such as closed system loading or local exhaust ventilation. HeiQ[®] AGS-20 powder cannot be applied using open pouring methods. The engineering controls shall provide, at the least, a 10 fold reduction in the concentration of airborne HeiQ[®] AGS-20 powder as compared to the HeiQ[®] AGS-20 powder concentration generated without engineering controls. In addition, workers exposed to powder are required to wear personal protective equipment including a full-face respirator with high-efficiency filter cartridges (i.e. P100), gloves, a long-sleeve shirt, long pants, shoes plus socks, and overalls or a Tyvek[®] suit during powder handling. The gloves shall be chemically resistant to all of the components of the textile fiber master batch or coating formulations to which the HeiQ[®] AGS-20 powder is added.

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Call a poison center or doctor for treatment advice.

IF INHALED: Move the person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to by a poison control center or doctor. Do not give anything to an unconscious person.

IF ON SKIN: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

Have the product container or label with you when calling a poison control center or doctor or going for treatment. For emergency information on (product, use, etc.) call the National Pesticides Information Center at 1-800-858-7378, 6:30 AM to 4:30 PM Pacific time (PT), seven days a week. During other times, call the poison control center 1-800-222-1222.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish, aquatic invertebrates, oysters, clams, and shrimp. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

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DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

This product may not be used for any applications involving food contact, food packaging, or drinking water.

HeiQ[®] AGS-20 is an antimicrobial additive for commercial and industrial use. It is designed to be incorporated into materials and intermediate polymer and coating solutions during the manufacturing process to impart durable antimicrobial and preserving activity to manufactured products. The product **suppresses** the growth of odor, stain, discoloration, degradation or contamination causing microbes. If microbial activity in the manufacturing product could lead to unpleasant odors, discoloration, deterioration or contamination of the product, then such claim may be made for the manufactured product. Manufactured products incorporating **HeiQ[®] AGS-20** may not make any public health claims relating to antimicrobial activity without first obtaining an EPA registration for the manufactured product. When incorporated into treated articles, **HeiQ[®] AGS-20** does not protect users of any such manufactured product or others against food-borne or disease-causing bacteria, viruses, germs or other disease-causing organisms.

HeiQ[®] AGS-20 may be used in materials and intermediate polymer and coating and finishing solutions that may be incorporated into the treated articles listed below. For coating and finishing-type applications using solutions, the final textile article may contain a maximum of 0.002% (by weight) of silver. For all other applications, the final textile article may contain from 0.001% to 0.01% (by weight) of silver. Contact HeiQ Materials AG to determine the appropriate amount of **HeiQ[®] AGS-20** for individual finished products.

NON-FOOD CONTACT USES

HeiQ[®] AGS-20 may be incorporated into manufactured products listed below for non-food contact uses.

Textile Fibers and Fiber Coatings and Finishes: For use in/on natural and synthetic fibers and fabrics, including nonwovens fabrics, such as mattress cover pads and filling; pillow covers, sheets, blankets, fiberfill for quilts and pillows; curtains; draperies; carpet and carpet underlay; rugs; upholstery; table cloths; napkins; wiping cloths; mops; towels; bags; wall covering fabrics; cushion pads; sleeping bags; brush bristles; filters; sponges; packaging; conveyor belts; automotive, aviation and truck upholstery; carpeting; rear decks; trunk liners; convertible tops and interior liners; umbrellas; outerwear; uniforms; gloves; coats; aprons; sportswear; sleepwear; stockings; socks; hosiery; caps; undergarments; inner liners for jackets; shoes; helmets; artificial leather; book covers; cloth for sails; ropes; tents and other outdoor equipment; tarps, awnings and other woven, knitted or non-woven made textile articles.

ACCEPTED
with COMMENTS
EPA Letter Dated:

DEC 1 2011

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage and disposal.

Pesticide Storage: Do not store in areas accessible to children. Keep containers covered and away from water and excessive moisture or humidity. Store at ambient temperatures.

Pesticide Disposal: Wastes from use of this product may be disposed of on site or at an approved disposal facility.

Container Disposal: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill or incineration, or if allowed by state and local authorities, by burning. If burned, stay out of smoke.

WARRANTY STATEMENT

HeiQ Materials AG warrants that this product conforms to the chemical description on the label. HeiQ Materials AG makes no warranties of merchantability or fitness for a particular purpose or any other expressed or implied warranty except as stated above.

HeiQ Materials AG
Zuercherstrasse 42
CH-5330 Bad Zurzach
Switzerland
(347) 414-9113

ACCEPTED
with COMMENTS
EPA Letter Dated:
DEC 1 2011

Under the Federal Insecticide,
Fungicide, and Rodenticide Act as
amended, for the pesticide,
registered under EPA Reg. No.

85249-1