April 4, 2016

PUBLIC DOCUMENT

Submitted electronically to publiccomments@bis.doc.gov

Regulatory Policy Division
Bureau of Industry and Security
U.S. Department of Commerce
Room 2099B
14th Street and Pennsylvania Avenue, NW
Washington, DC 20230

ATTN: Dennis Krepp, Director, Office of National Security and Technology Transfer Controls, Bureau of Industry and Security

Subject: RIN 0694-AF75; Umicore Public Comments

Dear Mr. Krepp:

Umicore USA, Inc. ("Umicore USA"), its parent N.V. Umicore S.A. of Belgium, and its domestic subsidiary Umicore Optics Materials USA Inc. ("UOM"), collectively "Umicore," respectfully submit these comments in response to the February 19, 2016 notice of proposed rulemaking published by the U.S. Department of Commerce, Bureau of Industry and Security ("BIS") concerning optics equipment. See "Revisions to the Export Administration Regulations (EAR): Control of Fire Control, Laser, Imaging, and Guidance and Control Equipment the President Determines No Longer Warrant Control Under the United States Munitions List (USML)," Fed. Reg. (February 19, 2016).[1]

Umicore applauds the substantial improvement from the prior May 5, 2015 version of this rulemaking. The elimination of the proposed export control classification number ("ECCN") 6A615, with its arbitrary and onerous controls on germanium and chalcogenide infrared optical blanks, is a major step in the right direction. Umicore greatly appreciates the careful attention the U.S. government paid to the industry's public comments on the prior version, which is reflected in the changes to the February 19, 2016 proposed rule.

However, further revisions are necessary to achieve clarity and consistency in the controls applicable to infrared optical elements, including lenses and blanks (which are the unfinished precursors to lenses). In particular, Umicore emphatically requests the U.S. government to abandon the "specially designed" concept as applied to infrared optical elements. While some commenters in the last round urged the U.S. government to apply that concept to their products,[2] "specially designed" is uniquely problematic for infrared optical elements and will continue the classification uncertainty for this particular segment of the industry.

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[1] Umicore separately is providing comments on the U.S. State Department's corresponding proposed rulemaking concerning revisions to USML Category XII, which also impacts optics products.

[2] However, several commenters, including Umicore, instead proposed alternate positive control parameters.

There is no need to resort to the "specially designed" catch-all approach in controlling infrared optical elements. Industry-accepted technical criteria are available for distinguishing products that are uniquely military in their application. These criteria are supported by existing commodity jurisdiction ("CJ" rulings) that determine which lenses should be controlled versus those that are EAR99. Most infrared lenses and blanks made of germanium and chalcogenide are, and should remain, EAR99. Providing clear, positive thresholds for control will prevent ambiguity about whether customized products that are currently EAR99 will inadvertently be pulled into higher controls through the "specially designed" concept. Furthermore, use of positive control parameters will better serve the stated policy of export control reform, as described in the proposed notice of rulemaking, to create a "a positive list—one that does not use generic, catch-all controls for items listed." See 81 Fed. Reg. at 8429.

The reason "specially designed" does not work for the infrared optical element industry is that manufacturers, such as Umicore, typically produce most of their products according to customer specification. A manufacturer that receives orders from both commercial and military customers – that have overlapping but unique specifications, such as size, curvature, and fit – will have to perform the "specially designed" analysis for every single order. Many products ordered by military customers have the same general function and capabilities as those ordered by commercial customers. While a lens might be customized for a military end-user, it may not necessarily meet the requirements of "specially designed" – but the manufacturer would have to go through the multi-step "specially designed" analysis for each product to confirm that. For a company that has thousands of unique part numbers due to customized orders, this will be extraordinarily burdensome and will inevitably lead to inconsistencies in classifications across the industry. This industry needs a bright line rule that it can apply in determining whether products are controlled.

The below discussion provides information about Umicore, a brief summary of how infrared lenses and blanks would be treated under the new proposed rule, followed by an explanation of Umicore's recommendations for this rulemaking, and then a chart that sets forth Umicore's proposed control thresholds.

I. Company Background

Umicore is a multinational materials company headquartered in Belgium, with more than 14,000 employees in 38 countries. Umicore USA, located in Raleigh, North Carolina, is a U.S.-based subsidiary of Umicore. Umicore USA holds UOM, located in Quapaw, Oklahoma, which is the leading U.S. manufacturer of germanium products. The Quapaw facility also performs high volume assembly of infrared imaging products made from GASIR, Umicore's proprietary germanium-based chalcogenide glass. End-use applications for Umicore's infrared optical products include automotive, thermal imaging, security and surveillance, fire-fighting, defense, and many other commercial and dual-use applications.

Through its U.S. subsidiaries, Umicore provides many high tech engineering and manufacturing jobs within the United States. Umicore's U.S. operations compete on a global basis and derive a substantial and growing portion of their revenue from export-based sales. Umicore expects exports from the United States to increase. However, this rulemaking could have a significant impact on the company's incentives to grow its U.S. operations. Umicore's

technology is predominantly E.U.-origin, with technology transfers and production capabilities generally provided from the foreign parent to the U.S. operations. If restrictive unilateral controls apply to optics technology and products within U.S. jurisdiction, which do not apply in the E.U. export control regime, companies like Umicore that also have production facilities in Europe may need to reevaluate their United States growth strategies.[3]

II. Treatment of Infrared Lenses and Blanks Under New Proposed Rule

Under the existing regulatory framework, neither infrared lenses nor blanks are explicitly controlled anywhere on the USML or the CCL. Through a series of CJ rulings issued to private parties, the U.S. government has determined that some infrared optics may be controlled under the "specifically designed" catch-all paragraph for parts and components under USML Category XII(e), if they are not EAR99. To the extent that germanium or chalcogenide lenses or blanks are Commerce controlled, Umicore is not aware of any CJ rulings indicating that such items would fit under any ECCN on the CCL. Thus, the current default is that most germanium and chalcogenide lenses and blanks are EAR99, with the exception of some items that meet specific military criteria set forth in CJ rulings, which fall under USML Category XII(e).

Under the February 19, 2016 rulemaking, optical blanks would be removed entirely from State Department jurisdiction. Further, there are no proposed controls for the CCL that would explicitly capture germanium or chalcogenide blanks. BIS explained in its Federal Register notice that, "many of the items proposed for control under ECCN 6A615.c [i.e., blanks made of germanium, chalcogenide, or other materials over a certain size] in the May 5 proposed rule would be adequately captured as dual-use items under ECCN 6C004." See 81 Fed. Reg. at 8426. Umicore notes that ECCN 6C004, which controls certain highly sensitive optical materials, does not cover germanium or chalcogenide, which are common optical materials used in many simple commercial infrared applications. This leads to the default that germanium and chalcogenide blanks would be EAR99, except for those that might get pulled into the "specially designed" catch-all paragraph (x) in the proposed ECCN 7A611 for military fire control, laser, imaging, and guidance and control equipment.

As for germanium and chalcogenide lenses, the State Department's rulemaking would place "specially designed" infrared lenses under the proposed USML Category XII (e)(17). The Commerce Department's rulemaking would not create any new controls for germanium and chalcogenide lenses (which items currently are EAR99 if not subject to USML jurisdiction).

Umicore agrees with the rulemaking insofar as it would entirely remove blanks from USML jurisdiction. Umicore similarly urges the U.S. government to remove infrared lenses entirely from USML jurisdiction. Further, EAR99 should continue to be the default control for germanium and chalcogenide infrared optical elements. To the extent that higher control is appropriate for some specific types of infrared lenses and blanks, they should be subject to Commerce jurisdiction. Further, the Commerce Department should articulate clear, positive criteria for capturing those products under certain ECCNs, rather than creating ambiguity as to whether they might fall in a 600-series "specially designed" catch-all paragraph.

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[3] For more information about foreign production of infrared optical elements, please see the market information attached as an appendix to these comments (this is an updated version of the information Umicore provided with its comments on the previous rulemaking).

III. The Need for Clear, Positive CCL Controls on Certain Infrared Optics

Most infrared optical elements – including those procured by military customers – are, and should remain EAR99. An infrared lens, by itself, is simply a single piece of material through which infrared light can pass. In the case of Umicore's products, lenses are made either of germanium (a natural metal) or chalcogenide glass, which are transparent to infrared light. A lens is cut, shaped, and polished to achieve different types of focus or magnification as the light passes through. It is a mechanical item; it is not electronic, it is not a sensor, and it cannot interpret the light that passes through it. A blank is the unfinished precursor to a lens. In other words, a blank is material that has been sliced to the rough dimensions needed for further working into a lens. A blank has no optical functionality.

Due to their lack of functionality, all blanks should be EAR99, unless they are comprised of a material that is uniquely useful for military application. The only circumstance where blanks would meet that criterion is in the case of low resistivity optical grade germanium – meaning the average electrical resistivity measures below 5 Ω /cm at 20°C. Such material is especially useful in military infrared optics, in that it is hardened to electromagnetic interference ("EMI") and other electronic warfare countermeasures. Low resistivity optical grade germanium is difficult to achieve in the crystal pulling process and thus costs more, which makes the product less appealing to commercial customers.[4] Therefore, low resistivity is an appropriate point of demarcation between EAR99 optical blanks and those that should be controlled. This comports with current CJ rulings, which treat low resistivity optical germanium as controlled and high resistivity germanium (without regard to size or customization of dimensions) as EAR99. The Commerce Department could list blanks with resistivity below 5 Ω /cm at 20°C as controlled under a new paragraph in ECCN 7A611, where other military imaging items will go, rather than the "specially designed" catch-all paragraph (x) for parts and components.

Chalcogenide blanks should not be controlled in any circumstance. The low resistivity distinction does not apply to chalcogenide as a material. As a type of glass, it is a natural insulator and, thus, is not inherently useful for EMI resistance in the way that germanium (a metal and electrical conductor) can be. Chalcogenide could be coated with a special EMI-resistant material on its surface, but that coating happens later in the manufacturing process after the material has been converted into a lens and has been fully optically worked and polished. It is, therefore, not feasible to distinguish a commercial-use chalcogenide blank from a military-use chalcogenide blank, due to the unfinished form. Further, since current practice under existing CJ rulings is to treat high resistivity germanium as EAR99, without regard to size or customized dimensions, the same standard should apply to chalcogenide blanks (which are all high resistivity). Accordingly, all chalcogenide blanks should be EAR99.

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[4] Umicore notes that these comments regarding low resistivity <u>only</u> apply in the context of optical grade germanium. There are other uses for non-optical grade germanium that require low resistivity. For example, wafer substrates for solar panel cells used in consumer houses, which are EAR99, require ultra-low resistivity to mitigate against the effects of natural solar EMI. Solar panel grade germanium wafers cannot be used in infrared optical applications.

As for infrared lenses, given their simple, mechanical functionality, they should not be controlled on the USML. To the extent that a finished lens could be modified with special features to make it unique to military end-use, they rather should be controlled on the CCL, under ECCN 7A611. Further, the Commerce Department should state clear, positive reasons for control in a stand-alone paragraph for optical elements, as opposed to allowing those items to be caught by the "specially designed" catch-all paragraph (x) for parts and components.

Umicore proposes the following thresholds for the control of infrared lenses, including those made of germanium, chalcogenide, or other materials, that are unique to military requirements. These criteria are consistent with existing CJ rulings that previously have established parameters for USML control of infrared lenses (versus EAR99), as well as current and foreseeable industry practice.

- Average electrical resistivity below 5 Ω /cm at 20°C (this would, in practice, apply to germanium but not to chalcogenide);
- Specially coated for counter-counter measures against electromagnetic interference and other forms of electronic warfare;
- Dome shaped contouring "specially designed" for use in missile applications;
- "Space qualified"; or
- "Specially designed" to function with cooled thermal imaging systems.

Any infrared lenses that do not meet the above criteria should be EAR99.

IV. Umicore's Proposed Alternate Control Thresholds

The below chart sets forth Umicore's proposed control thresholds, based on product category and ECCN.

	Optics Blanks	**Infrared Lenses**
USML Cat. XII	None (keep as proposed)	None (eliminate "specially designed" lenses as proposed)
ECCN 7A611	• Germanium blanks only, with resistivity below 5 Ω /cm at 20°C. • No chalcogenide blanks.	• Lenses with resistivity below 5 Ω /cm at 20°C (relevant only to germanium); • Lenses specially coated for counter-counter measures against electromagnetic interference and other forms of electronic warfare; • Lenses with dome shaped contouring "specially designed" for use in missile applications; • Lenses that are "space qualified";

		and • Lenses "specially designed" to function with cooled thermal imaging systems.
ECCN 6A004	• No controls for germanium or chalcogenide blanks (keep as currently implemented).	• No controls for germanium or chalcogenide lenses (keep as currently implemented).
EAR99	• Default for optics blanks of any material, except for low resistivity germanium blanks captured under ECCN 7A611. All chalcogenide blanks, and all high resistivity germanium blanks, are EAR99.	• Default for lenses of any material not captured under positive controls in ECCN 7A611. • All other infrared lenses that do not meet the ECCN 7A611 criteria are EAR99.

Umicore greatly appreciates this opportunity to provide comments on this proposed rulemaking. Should the Commerce Department require any further information, the undersigned may be contacted at: thomas.mckelvey@am.umicore.com or at (919)-874-2127.

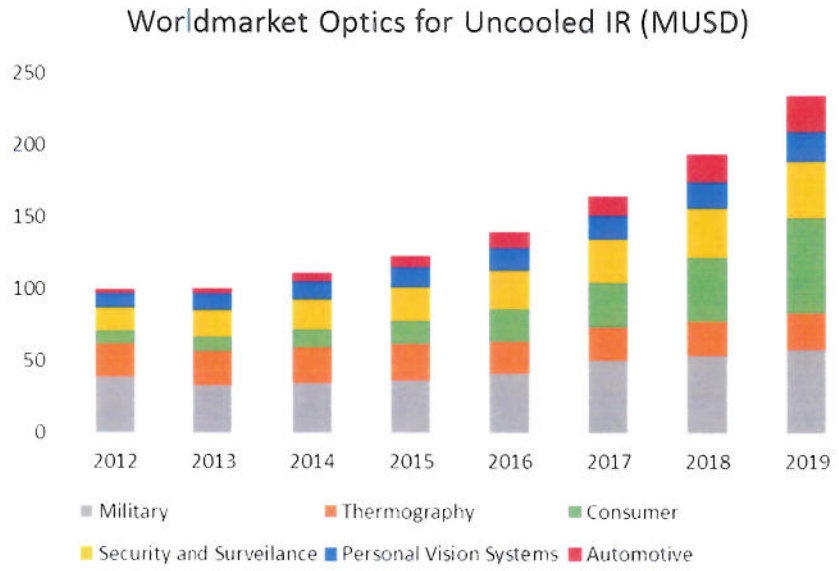
Respectfully submitted,

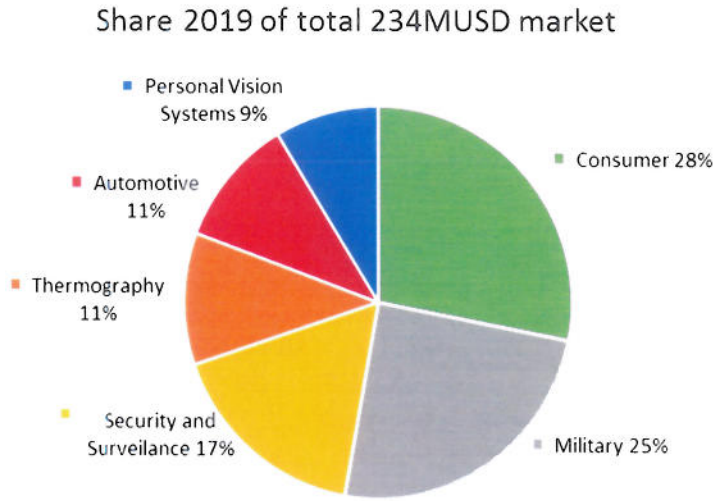
Thomas R. McKelvey
Umicore USA Inc.
Regional Trade Compliance Manager

Enclosure:

- Appendix with world market information

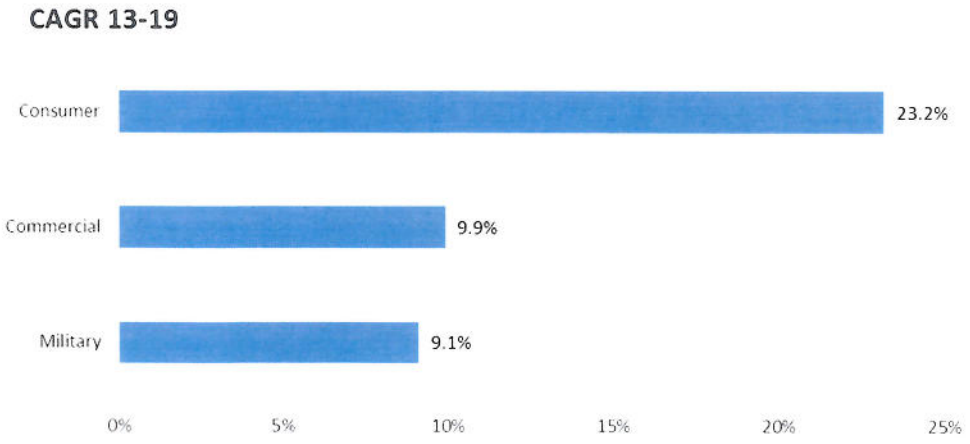
APPENDIX





MUSD = $ U.S. dollars, in millions

CAGR = cumulated annual growth rate



Examples of Foreign Optics Producers

Demonstrated technology and production capabilities equivalent to or exceeding U.S. industry.

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Examples of Foreign Blanks Products

Photonics Sense – Germany
Germanium blanks up to 500mm (20") diameter
http://www.photonic-sense.com/images/PDF_DB/Germanium_DB_en_Kompromiss_140407.pdf

OJSC – Russia
Germanium blanks up to 200mm (8") diameter
http://www.made-in-zelenograd.com/companies/ojsc-germanium/#page4
and
http://www.ved.gov.ru/eng/companies/exporters/?action=companyinfo&id=34533

Examples of Foreign Window Products

Diameter > 5"

Wavelength – Singapore

Part No.	Material	Diameter (mm)	Thickness (mm)	Wavelength(um
WGE-142-6-BB	Ge	142.0	6.0	8-12
WGE-150-15-BB	Ge	150.0	15.0	8-12
WGE-152X120X6.54-BB	Ge	152*120	6.5	8-12
WGE-156-6-BB	Ge	156.0	6.0	8-12
WGE-160-6-BB	Ge	160.0	6.0	8-12
WGE-178-6-BB	Ge	178.0	6.0	8-12

Examples of Foreign Infrared Lens Products

Focal Length Greater than 100mm

Shalom EO - Israel
IR Lenses for 640x480-25um LWIR uncooled FPA Detectors

No.	Module	Focal length (mm)	F#	Field of View (H x V)	Focus Mechanism	Flange Back Dist (mm)	Mechanical Connector
9	2120F1.0	120	1.0	7.6°x5.7°	Motorized	20	M54x1
10	3123F0.8	123	0.8	7.4°x5.6°	Motorized	20	2.325" -12TPI
11	2150F1.0	150	1.0	6.1°x4.6°	Motorized	20	M54x1
12	3180F1.2	180	1.2	5.1°x3.8°	Motorized	14.8	Flange
13	2200F1.3	200	1.3	4.6°x3.4°	Motorized	20	2.325" -12TPI
14	3275F1.4	275	1.4	3.3°x2.5°	Motorized	20	2.325" -12TPI

http://www.shalomeo.com/product/thermal-imaging/ir-lenses-for-uncooled-thermal-imaging-cameras/lens-for-640x480-25um-fpa-19.html

Dual FOV and Zoom Lenses for 640x480-17um LWIR uncooled FPA Detectors

No.	Module	Focal Length (mm)	F#	Field of View (H x V)	Focus Mechanism	Flange Back Dist (mm)	Mechanical Connector
1	DF-22.6F0.9-114.5F1.0 Double FOV	22.6	0.9	24°x18°	Motorized	32	flange
		115	1.0	4.8°x3.6°			
2	DF-44F1.0-132F1.1 Double FOV	44	1.0	12.5°x9.4°	Motorized	15	M45x1
		132	1.1	4.2°x3.1°			
3	DF-42/0.82-107/1.0 Double FOV	42	0.82	13°x9.8°	Motorized	30	flange
		107	1.0	5.1°x3.9°			
4	DF-51/1.1-153/1.2 Double FOV	51	1.1	10.8°x8.1°	Motorized	15	M45x1
		153	1.2	3.6°x2.7°			
5	DF-25/0.9-75/1.0 Double FOV	25	0.9	21.7°x16.4°	Motorized	19.67	2.325"- 12TPI
		75	1.0	7.3°x5.5°			
6	DF-50/0.9-150/1.0 Double FOV	50	0.9	11°x8.2°	Motorized	28	flange
		150	1.0	3.7°x2.7°			
7	DF-35/0.9-140/1.0 Double FOV	35	0.9	15.6°x11.7°	Motorized	13.5	flange
		140	1.0	3.9°x2.9°			
8	Zoom-25/0.95-75/0.95 continuous	25~75	0.95	8.3°~24.6° x 6.2°~18.5°	Motorized	20	flange
9	Zoom-20/1.1-60/1.1 continuous	20~60	1.1	10.4°~30.4° x 7.8°~23.1°	Motorized	20	M54x1
10	Zoom-53/0.8-105/0.94 continuous	25~75	0.8 ~ 0.94	5.9°~11.7° x 4.4°~8.8°	Motorized	20	M54x1

http://www.shalomeo.com/product/thermal-imaging/ir-lenses-for-uncooled-thermal-imaging-cameras/double-fov-and-zoom-ir-lenses-2.html

Sunny Ningbo – China

F(Mm)	F#	Sensor	T 8-12	Field of View (°)	Focus
130	1.2	640*480 17μm	>84%	4.8(H)×3.6(V)	∞~10m
200	1.4	640*480 17μm	>84%	3.1(H)×2.3(V)	∞~20m
150	1	640*480 17μm	>84%	4.1(H)×3.1(V)	∞~40m

http://www.sunnyoptical.com/en/009002008/p324.html

Wavelength – Singapore

Part No.	Focal Length(mm)	F/#	Detector	Wavelength	Focus Type
Infra-LW1501.0-17	150	1.0	640x480, 17um	8um-14um	Manual Focus
Infra-LW1501.2-17V2	150	1.2	640x480, 17um	8um-14um	Manual Focus
Infra-LW1501.4-17	150	1.4	640x480, 17μm	8um-14um	Manual Focus

Infra-LW1502.0-17	**150**	2.0	640x480, 17µm	8um-14um	Manual Focus

http://www.wavelength-tech.com/IR-Optics/LWIRInfraLens.jsp

Resolve Optics – United Kingdom

Focal Length	F/Number	Focus Type	Spectral Range
120	1.2	Fixed	8-14um

http://www.resolveoptics.com/ir-lens-320-000.html

Tamron – Japan

Detector Size 17µm pixel pitch VGA (640×480)

Standard M34 Screw

Model No.	Focal Length	F number	Max object distance (m)
▸ LVZ3X3516N/A	35-105mm (3x zoom)	F/1.6	3,083

http://www.tamron.biz/en/data/thermal/index.html

12 micron pixels or smaller

Ophir - Israel

Focal Length	F/Number	Focus Type	Sensor Compatibility	Part Number
140mm	1.4	Fixed	1024X768 pixels,12µ pitch	65182
150mm	1.0	Motorized	1024X768 pixels,12µ pitch	65043
210mm	1.4	Motorized	1024X768 pixels,12µ pitch	65070

http://www.ophiropt.com/infrared-optics/catalog-infrared-lenses/lenses-for-uncooled-cameras