Celanese

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Mr. Timothy Mooney
Regulatory Policy Division
Bureau of Industry and Security
U.S. Department of Commerce
14th Street and Pennsylvania Avenue, N.W.
Room 2705
Washington, DC 20044

Re: Notice of Inquiry – CCL / Proposed Modification of ECCN 1C008.b

Dear Mr. Mooney:

Celanese International Corporation ("Celanese"), by and through its subsidiary, Ticona Polymers, Inc. ("Ticona"), would like to submit for your consideration a comment to the proposed rule, "Commerce Control List: Revising Descriptions of Items and Foreign Availability" (75 Fed. Reg. 7664). Our comment relates to Export Control Classification Number ("ECCN") 1C008.b, which controls certain "High Heat" Liquid Crystal Polymers ("LCPs"). Ticona produces LCPs for the global marketplace and therefore has a direct interest in ensuring that ECCN 1C008.b is "clear" and "positive," as described in the proposed rule. The company also wants to ensure that Ticona products are properly classified under the proposed "Tiering" system.

I. RELEVANT BACKGROUND ON LCPs

LCPs are an engineering thermoplastic that typically exhibit high mechanical strength at high temperatures, extreme chemical resistance, inherent flame retardancy, low heat of fusion and good weatherability. These properties make LCPs a favored choice for making miniature and ultrathin parts down to 0.1 mm wall thickness that can be molded with an extremely short cycle time. LCP industry competitors include other high performance thermoplastics and engineering resins, including PPS (polyphenylene sulfide), PPA (polyphthalamide), PCT (polycyclohexylenedimethylene terephthalate) and nylon 46. LCPs' unique combination of high stiffness, high temperature resistance and high flow make them highly suitable for miniaturization in the electronics industry, in particular, and more recently for microinjection molding. LCPs can be used to fill long, thin sections and can be used for precision components. LCPs are also resistant to chemicals, such as acids, solvents, and hydrocarbons, and have excellent barrier properties. *See* CEH Data Summary, "Liquid Crystal Polymers" (hereinafter "CEH") at 10. Initially LCPs were used primarily for microwave and conventional oven cookware. However, since the 1990s, Electrical/Electronic ("E/E") applications have become the

major applications for LCPs, due to the demand for extremely small, high volume parts with precise dimensional stability that can withstand high temperatures.

LCPs are produced by combining a base polymer (resin), which is comprised of various monomers, and then compounding the resin with non-polymeric additives, such as glass fibers, talc, mica, or lubricants to form a resulting LCP compound. LCPs are currently differentiated based on their ability to withstand high temperatures.

II. PROPOSED CHANGE TO ECCN 1C008.b

A. Current Controls Under ECCN 1C008.b

ECCN 1C008 controls certain "Non-Fluorinated polymeric substances" for NS [National Security] and AT [Anti Terrorism] controls. Due primarily to the expansive NS controls, as well as the lack of available license exceptions, exports or reexports of products controlled under ECCN 1C008 generally require a license from the Bureau of Industry and Security ("BIS"). Within ECCN 1C008, subcategory 1C008.b. controls:

> b. Thermoplastic liquid crystal copolymers having a heat distortion temperature exceeding 523 K (250 C) measured according to ISO 75-2 (2004), method A, or national equivalents, with a load of 1.80 N/mm^2 and composed of:
>
> b.1. Any of the following:
>
> b.1.a Phenylene, biphenylene or naphthalene; or
>
> b.1.b. Methyl, tertiary-butyl or phenyl substitutes phenylene, biphenylene or naphthalene; and
>
> b.2. Any of the following:
>
> b.2.a. Terephthalic acid;
> b.2.b. 6-hydroyxy-2 naphthoic acid; or
> b.2.c. 4-hydroxybenzoic acid

See 15 CFR Part 774, Supplement No. 1 (ECCN 1C008.b.)

Liquid crystal copolymers that otherwise fall within ECCN 1C008.b., but cannot withstand the requisite heat distortion temperature exceeding 250° C, are controlled as EAR99 or 1C990 (depending on the additives used). Products controlled under EAR99 or 1C990 generally do not require an export

or reexport license, as they are not subject to more restrictive NS controls which apply to products falling within ECCN 1C008.b.

B. Reasons that Current ECCN 1C008.b Is Insufficiently "Clear" and "Positive"

As a result of Ticona's experience producing "High Heat" LCPs that are used in common civil applications (e.g., commercial electrical/electronic, automotive, chemical, industrial, medical, cookware, and other retail end uses), we believe that the current description of control used in ECCN 1C008.b should be changed, as this description is outmoded, and does not reflect current internationally accepted industry standards. Moreover, the current standard of control is subject to interpretation and varied results. In particular, the scope of thermoplastic LCPs covered is ambiguous. More importantly, the test method employed defining export-controlled LCP species is not a standard or reliable test method employed in the field.

i. Ambiguous Chemical Description of LCP Materials

Ticona notes that the current language of 1C008.b does not clearly identify the class of intended products covered by 1C008.b. The literal interpretation of 1C008.b is very confusing in that it implies that the polymers covered are a combination of poly(arylenes) and aromatic polyesters. Ticona is not aware of any commercial products that meet these parameters at this time. Ticona has always obtained export licenses for its "High Heat" LCP products because maintaining export compliance is a major focus of our business and we understand that BIS and the Department of Defense have historically considered 1C008.b to cover these types of LCP products. However, because of the ambiguity relating to the scope of covered products, an argument could be made that a license is not required for the export of LCPs and, indeed, there could well be those in the industry who are not obtaining licenses a result of a good faith belief that their products are not covered.

For improved clarity, Ticona recommends that BIS adopt the ATSM classification system for LCP species. Using the ASTM method, LCP materials are classified into groups, according to their chemical composition, and these groups are further subdivided into classes based on thermal performance as shown in the table below. Ticona believes that the ASTM classification system identified below offers a clearer and more-universally accepted definition as to the specific class of materials regulated under the spirit of 1C008b.

Liquid Crystal Polymers Classification System Described in ASTM D5138-06

Group	Description	Class	Thermal Properties
01	unsubstituted or methyl substituted,	1	high temperature

	wholly aromatic copolyester, polyether, or polyester amide	2 3	medium temperature general purpose
02	aromatic/aliphatic copolyesters, polyethers or polyesteramides	1 2 3	high temperature medium temperature general purpose
03	aromatic copolyesters, polyethers, or polyesteramides with aliphatic side chains	1 2 3	high temperature medium temperature general purpose
04	Blends	1 2 3	high temperature medium temperature general purpose

ii. Flawed Test Method

Currently, the test used to determine whether products are covered under 1C008.b relies upon heat distortion temperature (HDT) measured on test parts molded from unfilled polymers. This test method is flawed as it does not provide a fundamental material property, but that of a molded part. Accordingly, test results on unfilled samples can vary greatly based on quality of the sample and produced. While this is true for most viscoelastic materials, part-to-part variations are amplified when molding unfilled LCPs, given their highly-oriented nature under shear. Due to their anisotropic nature, mechanical properties, shrinkage and other characteristics depend heavily on the flow pattern in the final part as set by the molding conditions. Accordingly, HDT measurements on unfilled LCP species are not reported extensively. The patent art reflects the lack of faith in the properties of molded, neat materials as HDT values are generally recorded on molded glass-filled samples known to provide more reliable and reproducible data. As a result of the fundamental unreliability of this test method, Ticona generally only calculates HDT values of neat polymers for export classification purposes, and not for any commercial business purpose.

To bring this regulation more in line with industry standards, Ticona proposes that the test method be based on polymer melt point. Though LCPs do not exhibit a true melting point, all major suppliers in the industry employ the term to classify the thermal resistance of their product line based

on the conversion from solid to liquid crystal phase. The industry standard for determining the solid to liquid crystal transition point defined as the melt point or Tm is differential scanning calorimetry (DSC) as defined in ISO 11357-1 (2009).

C. Proposed Revision to ECCN 1C008.b

In order to comport with the ASTM D5138-06 classification rules and test methods defined by the commercial industry and described above, Ticona recommends that ECCN 1C008.b be modified to read as follows:

b. Aromatic polyesters, polyamides, or mixed polyesteramides polymers that do not display a solid to liquid phase thermal absorption below 653 K (380 °C) measured according ISO 11357-1 (2009) that are classified as:

b1. ASTM D5138, Group 01, Class 1 unsubstituted or methyl substituted, wholly aromatic copolyesters, polyamides, or mixed polyesteramide polymers

b2. ASTM D5138 Group 02, Class 1 mixed aromatic/aliphatic copolyesters or polyesteramides

b3. ASTM D138 Group 03, Class 1 aromatic copolyesters or polyesteramides with aliphatic side chains

b4. ASTM D138 Group 04, Class 1 blends of the above

In the alternative, if BIS is neither willing nor able to modify the standard, Ticona requests that the upper limit of control at least be raised to 375 ° C to ensure that LCPs used for non-sensitive, common commercial uses do not become needlessly controlled due to variations in testing that could improperly result in a heat distortion measurement greater than 250 ° C.

III. RECOMMENDED "TIERING" OF LCP PRODUCTS

A. The Majority of LCP Products Should Be Controlled Under "Tier 3"

In considering the "Tiers" under which LCPs currently controlled under ECCN 1C008 could be classified, Ticona respectfully requests that BIS be mindful of the broad commercial uses for which most LCPs are designed and used. Based on the criteria outlined in the proposed rule, Ticona believes that none of its LCP products or those of its closest competitors should be controlled at any level higher than Tier 3. From a national security perspective, most LCP products simply do not rise to the level of U.S. "crown jewels" controlled under Tier 1 that are exclusively available in the U.S. or are closely related to Weapons of Mass Destruction or provide a "critical military or intelligence

advantage to the United States." Similarly, Ticona does not believe that most LCP products controlled under ECCN 1C008 should be controlled under Tier 2 because, again, they do not provide a "substantial military or intelligence advantage to the United States, or make a substantial contribution to the indigenous development, production, use, or enhancement of a Tier 1 or Tier 2 item." Rather, as described in more detail below, the majority of LCP products is widely available throughout the world and are designed and used for benign commercial purposes.

1. Widespread Foreign Availability of LCPs, Including Most "High Heat" LCPs for Common Commercial Applications

As described above, because of their suitability for a variety of applications, LCPs, including High Heat LCPs, are widely available all over the world. World consumption of LCPs is expected to grow, which means that corresponding capacity must also grow to satisfy world demand. For that reason it is expected that future market expansions will most likely be in other Asian countries, mainly in China, as well as in Japan. Within the U.S., data indicates that the U.S. is a large net exporter of LCPs and that Asian countries are the major importers. This is not surprising, as the countries of Asia (particularly outside of Japan) have a large demand for LCP without the corresponding production facilities.

As a result of the widespread, increasing demand, particularly in Asia, there are many foreign companies that compound LCPs, including the High Heat products. Major LCP compounders include Samsung in Korea; Chang Chun and Shinkong in Taiwan; and Shanghai PRET in China. In Japan, major compounders include Sumitomo, Toray, Ueoni, Nippon Petro, Daicel Chemical Industries Ltd., and Polyplastics Company Ltd. Polyplastics also has LCP compounding production facilities in Taiwan and Malaysia.

2. "High Heat" LCPs Are Primarily Used for Common Commercial/Civil End Uses That Do Not Trigger National Security or Foreign Policy Concerns

Due to their suitability for a variety of commercial/civil applications, in the vast majority of instances, LCPs are not used for applications that are likely to trigger a national security or foreign policy concern (those minority of instances are discussed in Section B below). Rather, LCPs, including most of the "High Heat" LCPs that currently are subject to control under ECCN 1C008.b generally are used for common E/E applications as well as applications in the automotive, chemical, industrial, and medical industries, among others.

i. E/E Applications

Overall, the greatest demand for LCPs, including High Heat LCPs, results from E/E applications, which includes the telecommunications and audio/video industries. In the late 1990s,

most of the LCPs consumed were used to make electrical connectors with high pin densities for use in surface-mount technology (SMT"). SMT applications continue to provide a strong sales base for LCPs, due to the trend toward miniaturization which increases the demand for "thin wall" components and the demand for products that can withstand processing temperatures of 260° C or higher. High Heat LCPs are among the few plastics that are capable of meeting these requirements. As a result, LCPs are used to make chip carriers, printed circuit boards, coil forms, bobbins, sockets, capacitor housings, optoelectronic devices, potentiometers and switches. Other uses include the lens holders, components in compact disc players, burn-in sockets and test sockets with cam-activated locking devices and rails for circuit board production racks. *Id.* at 14.

Since the mid-2000s, regulations in Europe and elsewhere for "lead free" soldering further increased the demand for High Heat LCPs, as the ideal temperature in the lead free soldering process is in the 250-260° C temperature range, which means that LCP compounds that can withstand these high temperatures are required.

LCPs' high strength to weight ratio, flame retardance and high thermal stability also make them well suited for various types of business equipment, such as printers, inkjet printer cartridges, copiers, fax machines, audiovisual equipment, liquid crystal displays and hard disk drives. *Id.*

The ease with which LCPs can be precision-molded to meet exacting size and shape requirements mean that they are also used for a variety of computers and telecommunications devices. For example, Ticona estimates that of the E/E end uses in the LCP industry today, a substantial percentage are for mobile devices, including items such as smartphones like iPhones or Blackberrys, as well as for notebook computers, severs, desktops, and various entertainment devices. It is likely that the percentages for a number of these E/E applications will only increase in the future, especially as industries rebound from unfavorable economic conditions, which will lead to an increased demand for LCPs.

ii. Automotive Applications

LCPs are used in a variety of automotive applications, including fuel systems and electronics. In particular, LCPs are used as an encapsulation material for rotor magnets in the actuator motor of cruise control systems and antilock brake system sensors components for lamp holders and parabolic reflectors. Furthermore, the use of LCPs in the automotive industry may be on the rise, especially since LCPs appear to be well suited for fuel cells and other environmentally-friendly products, such components for improved emission standards. *Id.*

iii. Chemical and Industrial Applications

LCPs are used in a variety of chemical and industrial process applications such as chemical-detector housings, heat-sealer frames for industrial machinery, bushings for winches, pumps, meters, valve liners and chemical process tower packings. *Id.*

iv. Medical Applications

LCPs are also used to make a number of medical and dental devices such as cannulae, cutters, staplers, sterilization treys, graspers, scissors, laparoscopes, dental tools and surgical devices. These products require a plastic that is able to meet high strength and stiffness requirements and withstand high day-to-day sterilization requirements. *Id.*

v. Cookware and Other Commercial Applications

Cookware, including Tupperware, still represents a significant end use for LCPs, including High Heat LCPs. High performance LCPs also are used for other commercial/retail applications, such as optical fiber applications. They are also used in products as diverse as fishing poles, sailcloth and rope. *Id.* The Kuraray group, for example, produces the High Heat Vectran® fiber, which is a high performance multifilament yarn spun from LCPs that is an important constituent in various building and coating materials, adhesives, textiles, man-made leather, dental materials, carpets, furniture finishes and laminated safety glass. *See* <http://www.vectranfiber.com>.

B. The Polymeric Substances Of Concern Should be Specifically Identified and Remain Subject to Stronger Controls

Ticona, recognizes that since it designs all of its LCP products for general commercial use, it has incomplete knowledge of the particular characteristics of certain LCPs that may raise national security or foreign policy concerns. Ticona understands that although the vast majority of LCP sales are for the general commercial end uses identified above, a minority of LCPs and other plastics are used for applications that may raise national security and foreign policy concerns, such as military and aerospace applications. For example, Ticona is aware that certain plastics appear to have been designed for jet engine applications, among others, due to their weight bearing utility. In contrast, LCPs have a febrile nature and, therefore, are a poor bearing material, which makes them inappropriate for such applications.

Similarly, Ticona is aware of at least one polymeric substance that is suitable for sensitive aerospace and missile production end uses due to a variety of characteristics, including an extremely high melt point (greater than 425 ° C). Ticona does not believe that this type of substance is controlled

under ECCN 1C008.b. because it is not a thermoplastic and is not a copolymer. However, even to the extent ECCN 1C008.b. is the appropriate category, such a substance does not appear to have been designed specifically to be used in most consumer electronic applications and other commercial end uses, primarily because it is not injection moldable.

Ticona urges BIS to place any LCPs and other plastics of concern in a higher tier, rather than subjecting all LCPs to the same stringent controls, as is currently the case under ECCN 1C008.b. It is illogical and damaging to U.S. commercial interests to impose the same licensing requirements on LCPs used to produce Tupperware as are imposed on a minority of LCPs that are used for highly sensitive applications and, therefore, do provide a legitimate military or intelligence advantage to the U.S.

IV. CONCLUSION

In sum, Ticona believes that its proposed changes simply update and normalize ECCN 1C008.b to reflect current commercial demands and realities. Particularly in E/E industries, which drive most of the LCP demand, the focus on products that can be precision molded and withstand high production temperatures, especially to meet new "lead free" requirements, have increased the demand for "High Heat" LCPs for use in ubiquitous mobile devices, computers, office equipment, and televisions, among other common commercial items. However, Ticona's proposed changes maintain controls over LCPs and other plastics, whose vastly higher heat deflection thresholds and unique composition and chemical structures make them inappropriate for general commercial use and more suitable for sensitive end uses.

If you have any questions or require additional information, please do not hesitate to contact the undersigned, who may be reached at (972) 443-4913 or at raymond.mcguire@celanese.com. Ticona has more detailed data, statistics and other background material relating to its comment that it would be pleased to provide to BIS upon request.

Sincerely,

Christopher J. I. Gannon
Associate General Counsel