U.S. Court of Appeals for the Federal Circuit

CHEMTALL, INC., Plaintiff-Appellant v. UNITED STATES, Defendant-Appellee

Appeal No. 2016–2380

Appeal from the United States Court of International Trade in No. 1:12-cv-00079-LMG, Judge Leo M. Gordon.

Decided: December 21, 2017

MATTHEW R. NICELY, Hughes Hubbard & Reed LLP, Washington, DC, argued for plaintiff-appellant. Also represented by DANIEL MARTIN WITKOWSKI; ROBERT L. LAFRANKIE, AARON MICHAEL MARX, Crowell & Moring, LLP, Washington, DC.

ERIC LAUFGRABEN, Commercial Litigation Branch, Civil Division, United States Department of Justice, Washington, DC, argued for defendant-appellee. Also represented by CHAD A. READLER, JEANNE E. DAVIDSON, CLAUDIA BURKE; PAULA S. SMITH, Office of the Assistant Chief Counsel, United States Bureau of Customs and Border Protection, United States Department of Homeland Security, New York, NY.

Before DYK, BRYSON, and REYNA, *Circuit Judges.*

BRYSON, *Circuit Judge.*

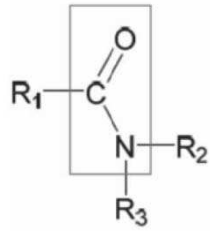
This customs classification case requires us to define the term "amide" as used in the Harmonized Tariff Schedule of the United States ("HTSUS"). In particular, we are called on to distinguish between "Amides" and "Other" in a heading of the HTSUS that covers amides, their derivatives, and salts thereof. Chemtall, Inc. appeals from a decision of the Court of International Trade holding that Chemtall's product, acrylamido tertiary butyl sulfonic acid ("ATBS"), is not an amide, but is a derivative of an amide. *Chemtall, Inc. v. United States*, 179 F. Supp. 3d 1200 (Ct. Int'l Trade 2016). We affirm.

I

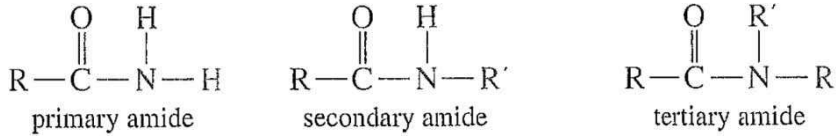
A

Heading 2924 of the HTSUS covers carboxyamide-function compounds and amide-function compounds of carbonic acids. All amides of this type contain an amide functional group consisting of a carbon atom (C), an oxygen atom (O), and a nitrogen atom (N), in which there is a double bond between the carbon and oxygen atoms, and a single bond between the carbon and nitrogen atoms. This amide functional group contains three substituents, or radicals (designated as R_1, R_2, and R_3), one of which is bonded to the carbon atom and two of which are bonded to the nitrogen atom. Each of the radicals R_2 and R_3 can

be a hydrogen atom (H) or a group of atoms beginning with a carbon atom bonded to the nitrogen atom. The functional group has the following general structure:



An amide with the general structure depicted above can be a primary, secondary, or tertiary amide. An amide in which the nitrogen atom is bonded to two hydrogen atoms (at locations R_2 and R_3) and a carbon atom is called a primary amide; it has the general structure R–$CONH_2$. An amide in which the nitrogen atom is bonded to one hydrogen atom and two structures each beginning with a carbon atom is called a secondary amide; it has the general structure R–CONHR'. An amide in which the nitrogen atom is bonded to three structures each beginning with a carbon atom is called a tertiary amide; it has the general structure R–$CONR'_2$. The structures of these three categories of amides can be depicted as follows:

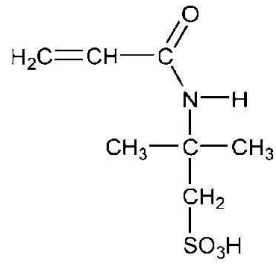


L.G. Wade, Jr., *Organic Chemistry* 984 (8th ed. 2013); *see also* Marc Loudon & Jim Parise, *Organic Chemistry* 1048 (6th ed. 2016).

The parties agree that in order to be considered an amide under the tariff schedule, a compound must contain an amide functional group. The central issue in this case is what elements may be included in the radical groups so that the entire compound will be considered an amide and when, with the addition of other elements, the compound ceases to be an amide.

B

The dispute in this case involves the proper classification of 38 entries of ATBS during 2010 and 2011. ATBS contains (1) an amide functional group and has a hydrocarbyl group in the R_1 position; (2) a hydrogen atom in the R_2 position; and (3) a compound containing hydrogen, carbon, oxygen, and sulfur (S) atoms in the R_3 position. The structure of ATBS can be depicted as follows:



The question before the court is whether the addition of the SO_3H group as part of the R_3 radical means that the compound is not an amide within the meaning of the HTSUS, but instead is a derivative of an amide.

The parties do not dispute that ATBS is properly categorized under heading 2924 of the HTSUS. Heading 2924 is divided into two categories. The first category, which is titled "Acyclic amides (including acyclic carbamates) and their derivatives; salts thereof," encompasses subheadings 2924.11 through 2924.19. The second category, which is titled "Cyclic amides (including cyclic carbamates) and their derivatives; salts thereof," encompasses subheadings 2924.21 through 2924.29. The distinction between acyclic and cyclic amides turns on whether the compound includes a cyclic structure of atoms. Because ATBS does not contain such a ring structure, it is acyclic.

The part of subheading 2924 that addresses acyclic amides reads as follows:

Heading/ Subheading	Stat. Suf- fix	Article Description	Unit of Quantity	G
2924		Carboxyamide-function compounds; amide-function compounds of carbonic acid:		
		Acyclic amides (including acyclic carbamates) and their derivatives; salts thereof:		
2924.11.00	00	Meprobamate (INN)	kg	Free
2924.12.00	00	Fluoroacetamide (ISO), monocrotophos (ISO) and phosphamidon (ISO)	kg	3.7%
2924.19		Other:		
2924.19.11		Amides		3.7%
	10	Acrylamide	kg	
	20	Dimethylformamide	kg	
	30	Methacrylamide	kg	
	50	Other	kg	
2924.19.80	00	Other	kg	6.5%

At the time of the entries, Chemtall classified its shipments of ATBS under subheading 2924.19.11.10, as "Other: Amides: Acrylamide," subject to a 3.7% duty rate. U.S. Customs and Border Protection ("Customs") disagreed. In notices of action issued in early 2011, Customs notified Chemtall that it had determined that ATBS was not an amide under subheading 2924.19.11 ("Amides"),but should be reclassified under subheading 2924.19.80.00 ("Other"), which carries a 6.5% duty rate. Chemtall protested the reclassification, and Customs denied the protests. Customs ruled that ATBS was not an acyclic amide, but a sulphonated derivative of an acyclic amide and therefore did not qualify as an "Amide" classifiable under subheading 2924.19.11.

Chemtall filed a complaint in the Court of International Trade seeking review of Customs' decision. In that action, Chemtall argued that the definition of an amide requires that the three radical groups attached to the amide functional group must consist of either hydrogen, a hydrocarbyl group, or what Chemtall referred to as a "substituted hydrocarbyl" group. Chemtall contended that the radical in the R_3 position of ATBS, which contains sulfur and oxygen, is a substituted hydrocarbyl group, and that ATBS is therefore an amide.

The government argued that the radicals attached to an amide functional group may consist only of hydrogen, alkyl groups, or aryl groups. Both alkyl and aryl groups are hydrocarbyls and do not contain sulfur or oxygen, so ATBS is excluded from the government's definition of "amide."

On cross-motions for summary judgment, the Court of International Trade adopted the government's definition of the term amide and held that ATBS is properly categorized under subheading 2924.19.80.00. Chemtall timely appealed.

II

A

In reviewing a classification ruling, we have "an independent responsibility to decide the legal issue of the proper meaning and scope of HTSUS terms." *Warner-Lambert Co. v. United States*, 407 F.3d 1207, 1209 (Fed. Cir. 2005). In so doing, however, "we accord deference to a classification ruling by Customs to the extent of its 'power to persuade.'" *Link Snacks, Inc. v. United States*, 742 F.3d 962, 965 (Fed. Cir. 2014) (quoting *United States Mead Corp.*, 533 U.S. 218, 235 (2001)). And in reviewing a decision of the Court of International Trade, "we give great weight to the informed opinion" of that court, which has expertise in international trade matters, including classi-

fication rulings. *Schlumberger Tech. Corp. v. United States*, 845 F.3d 1158, 1162 (Fed. Cir. 2017).

The classification of merchandise proceeds in two steps. First, the court must ascertain the meaning of the tariff term, which is a question of law that we review de novo. Second, the court must determine whether the merchandise in question fits within those terms, which is an issue of fact that we review for clear error. Where, as here, there is no dispute about the nature of the merchandise, the two-step inquiry "collapses into a question of law [that] we review de novo." *Lemans Corp. v. United States*, 660 F.3d 1311, 1315 (Fed. Cir. 2011).

B

The HTSUS governs the classification of imported merchandise and is "considered to be statutory provisions of law for all purposes." *Schlumberger*, 845 F.3d at 1163 (quoting 19 U.S.C. § 3004(c)(1)). The HTSUS is organized by headings, which are represented by the first four digits of an HTSUS provision. The headings are further divided into subheadings. *Id.* at 1163 & n.4. The HTSUS also contains General Notes, General Rules of Interpretation ("GRI"), and chapter or section notes. *Id.* The section and chapter notes "are not optional interpretive rules, but are statutory text." *Park B. Smith, Ltd. v. United States*, 347 F.3d 922, 926 (Fed. Cir. 2003); *see also* GRI 1 ("[F]or legal purposes, classification shall be determined according to the terms of the headings and any relative section or chapter notes . . . .").

Applying GRI 1, a court "first construes the language of the heading, and any section or chapter notes in question, to determine whether the product at issue is classifiable under the heading." *Orlando Food Corp. v. United States*, 140 F.3d 1437, 1440 (Fed. Cir. 1998). After determining that the product is classifiable under the heading, the court looks to the "subheadings to find the correct classification for the merchandise." *Id.* If an imported article is "described in whole by a single classification heading or subheading, then that single classification applies, and the succeeding GRIs are inoperative." *CamelBak Prods., LLC v. United States*, 649 F.3d 1361, 1364 (Fed. Cir. 2011).

When a tariff term is not defined in either the HTSUS or its legislative history, the term is "construed according to [its] common commercial meanings." *Millenium Lumber Distribution Ltd. v. United States*, 558 F.3d 1326, 1329 (Fed. Cir. 2009); *see also Carl Zeiss, Inc. v. United States*, 195 F.3d 1375, 1379 (Fed. Cir. 1999) ("Absent contrary legislative intent, HTSUS terms are to be con-

strued according to their common and commercial meanings, which are presumed to be the same."). "To discern the common meaning of a tariff term, we may consult dictionaries, scientific authorities, and other reliable information sources." *Kahrs Int'l, Inc. v. United States*, 713 F.3d 640, 644 (Fed. Cir. 2013).

In addition, a court may consider the explanatory notes published by the World Customs Organization. The explanatory notes "provide persuasive guidance and 'are generally indicative of the proper interpretation,' though they do not constitute binding authority." *Schlumberger*, 845 F.3d at 1164 (quoting *Kahrs Int'l*, 713 F.3d at 645).

III

The parties agree that ATBS should be categorized under HTSUS heading 2924, in the portion of that heading that applies to acyclic amides and their derivatives. That portion of heading 2924 contains three subheading sat the six-digit level: two (subheadings 2924.11 and 2924.12) cover specific named compounds. The third (subheading 2924.19) covers "Other" acyclic amides and their derivatives. Because ATBS is not one of the named compounds, the parties agree that it must fall under subheading 2924.19. That subheading is further divided into "Amides" (subheading 2924.19.11) and "Other" (subheading 2924.19.80). If, as the Court of International Trade held, ATBS is not an amide, it must fall under subheading 2924.19.80. That disposition is required by Subheading Note 1 to chapter 29 of the HTSUS, which provides that, absent a specific contrary designation, derivatives of a chemical compound are to be classified in the residual "Other" subheading if there is one in the series of subheadings at issue.

As a preliminary matter, the parties disagree about the meaning of the term "derivative" in HTSUS heading 2924. Chemtall argues that a "derivative" is limited to a compound that is chemically derived from another compound. The government argues that the term "derivative," as used in the HTSUS, refers to compounds that are related by structure, not solely by method of manufacture. We agree with the government's definition. *See E.T. Horn Co. v. United States*, 367 F.3d 1326, 1332 (Fed. Cir. 2004) ("'[D]erivatives' . . . should be given its broad, 'structurally related' meaning."); *Webster's Third New Int'l Dictionary* 608 (1986) (defining "derivative" as "a chemical substance that is so related structurally to another substance as to be theoretically derivable from it even when not so obtainable in practice"); *Merriam-Webster's Collegiate Dictionary* 342 (10th ed. 1986) (defining "derivative" as "a chemical substance related structurally to another

substance and theoretically derivable from it.");[1] Customs Headquarters Ruling Letter 085775, at 2 (Feb. 27, 1990)("[B]ased on the structure of the HTSUSA, the Chapter notes and the Explanatory Notes, it is our interpretation that a derivative of a compound results from the modification of that compound by adding to the moiety or basic structure of the compound without loss of that basic structure.").

On appeal, Chemtall renews its argument that ATBS qualifies as an amide because an amide may have radicals that contain "hydrogen, hydrocarbyl, or substituted hydrocarbyl." Chemtall defines "substituted hydrocarbyl" as "a hydrocarbyl where one or more hydrogen (H) atoms have been replaced with substituents containing *heteroatoms*." A heteroatom, Chemtall explains, is an atom that is not carbon or hydrogen; it can include nitrogen, sulfur, and oxygen.

The government argues that for a compound to be considered an amide, the radicals attached to the nitrogen atom in the compound's amide functional group must be either alkyl or aryl groups, whichcontain only hydrogen and carbon atoms.[2] Since ATBS contains heteroatoms, the government contends that it cannot be considered an amide and must instead be considered an amide derivative, classifiable not in the subheading for "Amides" (subheading 2924.19.11), but in the alternative subheading for "Other" (subheading 2924.19.80).

For the reasons set forth below, we find that the secondary sources are nearly all contrary to Chemtall's position, the limited evidence that supports Chemtall's interpretation is unpersuasive, and the explanatory notes to Chapter 2924 of the HTSUS do not support Chemtall's definition of amide. The court therefore holds that ATBS was properly classified under HTSUS subheading 2924.19.80.

A

Although Chemtall announces in its brief that "multiple treatises" support its definition of "amide," an examination of Chemtall's cited secondary sources discloses that Chemtall promises much more than it delivers.

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[1] We refer to the 1986 editions of the two cited dictionaries, as those are the closest editions before the 1989 enactment of the HTSUS. *See Airflow Tech., Inc. v. United States*, 524 F.3d 1287, 1291 n.2 (Fed. Cir. 2008).

[2] *See* Wade, *supra*, at 125 (defining "alkyl group" as the "group of atoms remaining after a hydrogen atom is removed from an alkane," and defining "alkane" as a "hydrocarbon having only single bonds . . . general formula: C_nH_{2n+2}"); *Hawley's Condensed Chemical Dictionary* (Richard J. Lewis, ed., 13th ed. 1997) (defining "alkyl" as a "paraffinic hydrocarbon group which may be derived from an alkane by dropping one hydrogen from the formula. . . . Such groups are often represented in formulas by the letter R and have the generic formula C_nH_{2n+1}," *id.* at 34; and defining "aryl" as a hydrocarbon group "whose molecules have the ring structure characteristic of benzene, naphthalene, phenanthrene, anthracene and similar molecules (i.e., either the 6-carbon ring of benzene or the condensed 6-carbon rings of the other aromatic derivatives). For example, an aryl group may be phenyl C_6H_5 or naphthyl $C_{10}H_6$. Such groups are often represented in formulas by 'R,'" *id.* at 94.).

To support its definition, Chemtall points to two organic chemistry textbooks. The first is L.G. Wade, Jr., *Organic Chemistry* (8th ed. 2013). First, Chemtall asserts that a section of the Wade text "lists penicillin as a typical amide," despite the fact that penicillin has sulfur in a radical bonded to the nitrogen atom. Based on that characterization, Chemtall argues that an amide may contain sulfur or other heteroatoms—*i.e.*, atoms other than hydrogen and carbon.

Chemtall, however, mischaracterizes Wade. On the page that Chemtall cites, Wade notes that "[c]yclic amides are called lactams," and provides examples of cyclic amides. Wade, *supra*, at 984. Penicillin is not discussed. Later, in a section that discusses the bioreactivity of lactams, Wade states that "β-Lactams are unusually reactive amides," and that "the β-lactam ring is found in three important classes of antibiotics . . . . *Penicillins* have a β-lactam ring infused to a five-membered ring containing a sulfur atom." *Id.* Wade thus describes penicillin as containing a lactam ring combined with a separate ring containing a sulfur atom, but does not characterize penicillin as an amide (as opposed to an amide derivative). *See* Peter Vollhardt & Neil Schore, *Organic Chemistry: Structure and Function* 945 (6th ed. 2011) (describing penicillin as a "β-lactam derivative").

More importantly, Wade's definition of the term "amide" is squarely contrary to Chemtall's position:

> An amide of the form R–CO–NH_2 is called a primary amide because there is only one carbon atom bonded to the amide nitrogen. An amide with an alkyl group on nitrogen (R–CO–NR') is called a secondary amide or an N-substituted amide. Amides with two alkyl groups on the amide nitrogen (R–CO–NR'$_2$) are called tertiary amides or N,N-disubstituted amides.

Wade, *supra*, at 984. Wade's definition of amide, which refers only to alkyl groups as substitutes for the hydrogen atoms bonded to the nitrogen atom, supports the government's position, not Chemtall's.

The second textbook on which Chemtall relies is David J. Hart et al., *Organic Chemistry: A Short Course* (13th ed. 2012).[3] The Hart textbook describes itself as a "brief introduction to modern organic chemistry . . . written for students who, for the most part, will not major in chemistry." *Id.* at xvi. In the section Chemtall cites, Hart

[3] Chemtall did not cite Hart in its motion for summary judgment before the Court of International Trade, and it was not made part of the record. Nevertheless, "[t]o discern the common meaning of a tariff term, we may consult dictionaries, scientific authorities, and other reliable information sources." *Kahrs Int'l*, 713 F.3d at 644; *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1322-23 (Fed. Cir. 2013) (en banc). We have therefore considered Hart on appeal even though it was not presented to the trial court.

describes the basic structure of a primary amide—*i.e.*, amides with the "general formula $RCONH_2$"—and provides a number of examples of primary amides. *Id.* at 313.[4]

In the sentence that Chemtall emphasizes, Hart characterizes secondary and tertiary amides as compounds "in which one or both of the hydrogens on the nitrogen atom are replaced by organic groups, are described in the next chapter." *Id.* Chemtall argues that the phrase "replaced by organic groups" is broad enough to encompass substituted hydrocarbyls. But the sentence on which Chemtall focuses does not purport to provide a definition of amide, and the examples of secondary or tertiary amides depicted in Hart contain only hydrogen and carbon atoms attached to the nitrogen atom in the amide functional group. *See id.* at 343–44. Furthermore, other sections of Hart suggest that the "R" radical is limited to hydrocarbyls. *See id.* at 42 ("R is the general symbol for an alkyl group."); *id.* at 558 (defining "Amides" as "Carboxylic acid derivatives in which the –OH group is replaced by $–NH_2$, –NHR, or NR_2"); *cf. id.* at 328 (defining amines, where "Primary amines have one organic group attached to the nitrogen, secondary amines have two, and tertiary amines have three," and where the "R groups in these structures maybe alkyl or aryl").

None of the other secondary sources cited by the parties support Chemtall's broad definition of an amide. Rather, the textbooks and dictionaries cited by the parties, and most of the sources consulted by the court, suggest that amides have only hydrogen or hydrocarbyls—alkyl or aryl groups—bonded to the nitrogen of the amide functional group. *See* A. David Baker et al., *Organic Chemistry* 834 (2d ed. 2010) (defining "amide" as a derivative of carboxylic acid containing $–NR_2$, –NHR, or $–NH_2$, in which "R can be an alkyl or an aryl group"); Loudon & Parise, *supra*, inside cover (depicting the structure of an amide and stating "R = alkyl, aryl, H"); Janice Gorzynski Smith, *Organic Chemistry*, G-2 (4th ed. 2014) (defining "amide" as "[a] compound having the general structure $RCONR'_2$, where R' = H or alkyl"); T.W. Graham Solomons & Craig Fryhle, *Organic Chemistry* 72 (10th ed. 2011) ("Amides have the formulas $RCONH_2$, RCONHR', or RCONR'R" where a carbonyl group is bonded to a nitrogen atom bearing hydrogen and/or alkyl groups."); Andrew Streitwieser et al., *Introduction to Organic Chemistry* 551 (4th ed. 1992) ("Amides, $RCONH_2$, are compounds in which the hydroxyl group is replaced by an amino group. The nitrogen of the amino group may bear zero, one,

[4] Although Chemtall criticizes the trial court and the government for relying on introductory organic chemistry textbooks, the Wade text on which Chemtall relies is an introductory text, and the Hart text, which is designed for non-chemistry majors, is the least sophisticated of any of the secondary sources cited by the parties.

or two alkyl groups."); Wade, *supra*, at 984; Amide, *Chemistry-Dictionary*, http://chemistry-dictionary.com/definition/amide.php (an amide is a "[c]ompound that can be considered a derivative of ammonia in which one or more hydrogens are replaced by [] alkyl or aryl groups"); Gamini Gunawardena, Amide, *OChemPal*, http://www.ochempal.org/index.php/alphabetical/a-b/amide) ("An amide is a carboxylic acid derivative [in which] R_1, R_2 and R_3 could be hydrogen atoms, alkyl groups, aryl groups, or any combination thereof.").

To be sure, there are secondary sources—not cited by the parties—that provide some support for Chemtall's definition. Jonathan Clayden et al., *Organic Chemistry* (2d ed. 2012), refers to two examples of amides, aspartame and paracetamol, each of which has heteroatoms in the radicals that are bonded to the nitrogen atom. *Id.* at 31. Similarly, John McMurry, *Organic Chemistry* (9th ed.2016), suggests that dipeptides, which also contain heteroatoms, are amides. *Id.* at 692. The cited passages in Clayden and McMurry, however, are not definitional in nature, and they may be understood as labeling compounds as amides that other sources would describe as amide derivatives, a distinction that is not always drawn in the texts but is expressly recognized in the HTSUS subheading classifying acyclic amides.

In sum, the great weight of authority indicates that amides, when precisely defined, are limited to having only hydrogen, alkyl, or aryl groups bonded to the nitrogen atom. Because ATBS contains sulfonic acid (SO_3H) in a radical attached to the nitrogen atom of the amide functional group, ATBS cannot, under the definitions provided in the secondary sources, be an amide.

B

Chemtall relies heavily on the testimony of its expert, Dr. Robson F. Storey, who took the position that ATBS is an amide because an amide can contain a "substituted hydrocarbyl" containing a heteroatom. Neither Dr. Storey's testimony, nor the evidence on which he relied, is persuasive, particularly in light of the broad consensus among the treatises, dictionaries, and textbooks that amides are limited to amide functional group compounds in which hydrogen, alkyl, or aryl groups are bonded to the nitrogen atom.

Dr. Storey insisted that his definition is "recognized universally by academic scientists," but his only citation to support that assertion was the Wade textbook, which, as discussed above, is contrary to Dr. Storey's definition. The Court of International Trade considered Dr. Storey's definition but found that it is not supported in the scientific

literature, a finding in which we concur.[5] Moreover, Dr. Storey's definition of "amide" in his declaration is undermined by the fact that his definition changed over the course of this litigation. Before advocating for a definition that includes substituted hydrocarbyls, Dr. Storey stated in a 2011 declaration that an amide must have "R_1, R_2, R_3 [that] are independently hydrogen, alkyl, or aryl," which is the definition urged by the government and adopted by the Court of International Trade.[6]

In support of his definition of "amide," Dr. Storey relied heavily on three patents: U.S. Patent Nos. 5,811,580 ("the '580 patent"); 6,482,983 ("the '983 patent"); and 8,383,760 ("the '760 patent"). The '580 patent is directed to the preparation of "N-hydrocarbyl-substituted amides," '580 patent, col. 1, ll. 8–9, although the patent does not provide a definition of the term "amide." The '983 patent uses the phrase "N-hydrocarbyl substituted amides" only in reference to the '580 patent and other applications by the same inventor as the '580 patent. '983 patent, col. 3, ll. 26–28. Finally, the '760 patent states: "As used herein, 'amide' refers to a compound of the following formula: [a graphic depiction of an amide functional group] wherein R^1–R^3 are each, independently, hydrogen or optionally substituted hydrocarbyl." '760 patent, col. 5, ll. 8–18. Dr. Storey is also a named inventor on a patent that defines amides using the same definition as the '760 patent. U.S. Patent No. 8,344,073, col. 6, ll. 25–35.

The cited patents do not support Chemtall's conclusion that the common and commercial meaning of amide includes substituted hydrocarbyls. It is well recognized that a patentee may set out a definition of a term and act as his own lexicographer. *See Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). The '760 patent and Dr. Storey's patent do so explicitly, beginning the definition of "amide" with the phrase "[a]s used herein." As Dr. Storey testified, when questioned about his own patent during his deposition: "The purpose here was to cover compounds that were important

[5] The Court of Customs and Patent Appeals and the Court of International Trade have held that expert witness opinions may be considered in determining the meaning of a tariff provision, but that such opinions are merely advisory, *United States v. Crosse & Blackwell, Inc.*, 22 C.C.P.A. 214, 217–18 (1934), and "are given weight only to the extent they are consistent with lexicographic and other reliable sources," *Samsung Int'l, Inc. v. United States*, 887 F. Supp. 2d 1330, 1339 n.18 (Ct. Int'l Trade 2012). *See also Kahrs Int'l, Inc. v. United States*, 791 F. Supp. 2d 1228, 1240 (Ct. Int'l Trade 2011) (expert testimony as to the common meaning of terms "should be subordinate to reliable textual sources").

[6] Although in that declaration Dr. Storey also referred to ATBS as an "amide," he did so on the ground that ATBS is produced using a particular reaction, the Ritter reaction, and that chemists "generally understand that the product of the Ritter reaction is an amide." He also relied on the assertion that ATBS is similar to other compounds that Customs classifies under subheading 2924.19.11.50. Chemtall has not pressed either of those arguments on appeal.

to the invention, not to put forth a definition of amide, necessarily." The patents cited by Dr. Storey thus do not contradict the definition set forth in the cited dictionaries and other secondary sources.

Chemtall also relies on a government laboratory report and testimony from the technician who prepared that report. A Customs laboratory prepared a report on a sample of ATBS, which identified it as "a carboxyamide function compound containing acrylamide and has characteristics of 2-Acrylamid[o]-2-methylpropanesulfonic acid (ATBS)." Chemtall points to three pages from the laboratory report that include test results and handwritten comments written by the laboratory technician. The handwritten notes read "consistent with secondary amide" on one chart, "secondary amide N-H stretch" on a second chart, and "Amide I C=O" and "Amide II N-H Bend" on the third chart. The notes merely reflect the laboratory technician's recognition that ATBS contains an amide functional group with one hydrogen atom bonded to the nitrogen atom, indicating the general structure of a secondary amide. And although the technician testified—as a fact witness, not as an expert—that ATBS fell within what he understood to be the definition of an amide, he added that it was his understanding that any compound containing an amide functional group would be considered an amide. That very broad definition is inconsistent with either party's definition as well as being inconsistent with the secondary sources cited above. The court does not find the technician's view as to the meaning of "amide" to be a reliable indication of the common and commercial usage of the term.

C

The parties next debate the meaning of the explanatory notes to heading 2924 as it relates to the interpretation of the term "amide" as used in the tariff schedule. Each side contends that the explanatory notes support its argument. In fact, the explanatory notes contain internal inconsistencies that render them of little use in discerning the meaning of the term "amide" in the HTSUS.

The explanatory notes first state that "[a]mides are compounds which contain the following characteristic groups": ($–CONH_2$), which the explanatory notes describe as the basic structure of a primary amide; (($–CO)_2NH$),which the explanatory notes describe as the basic structure of a secondary amide; and (($–CO)_3N$), which the explanatory notes describe as the basic structure of a tertiary amide. That description of "amide" means that a secondary amide must contain two –CO groups, and a tertiary amide must contain three such groups. To the extent that description is taken as definitional, it is

very narrow and is at odds with the definition of "amide" offered by either Chemtall or the government.

Moreover, that description of "amide" is inconsistent with the next sentence of the explanatory notes, which states, "[t]he hydrogen of the ($–NH_2$) or (>NH) groups may be substituted by alkyl or aryl radicals, in which case the products are N– substituted amides." As the Court of International Trade found, that sentence supports the government's position that an amide may include only alkyl or aryl radicals. Chemtall argues that this sentence does not foreclose the possibility that the hydrogen atom may be substituted by other radicals as well, including a "substituted hydrocarbyl" radical. That interpretation of the "may be substituted" sentence is unconvincing. By listing the groups that "may be substituted" for the hydrogen atom, the explanatory notes implicitly exclude other groups.[7]

Other parts of the explanatory notes, however, appear at least facially to be inconsistent with the limitation that an amide may contain only alkyl or aryl radicals in the R_2 and R_3 radicals. For example, the next sentence of the explanatory notes reads: "Some amides of this heading also contain a diazotisable amine group." A diazotisable amine group includes an amine group, $–NH_2$, bonded to an aryl group, which would suggest that an amide can contain, at the least, the heteroatom nitrogen in one of the radicals bonded to the nitrogen in the amide functional group. In addition, the explanatory notes provide examples of acyclic and cyclic amides that appear to be inconsistent, in part, with the explanatory notes' definition of amide. Although all of the acyclic amides feature only hydrogen and hydrocarbyl groups bonded to the nitrogen atom of the amide functional group, some of the cyclic amide examples contain atoms besides hydrogen and carbon in the radicals that are bonded to the nitrogen atom.

Viewed as a whole, the explanatory notes do not clearly weigh in favor of either party. On the one hand, the definition that the "hydrogen . . . may be substituted by alkyl or aryl radicals" is consistent with the definition given in the dictionaries and textbooks cited above and supports the government's position. Similarly, although the portion of the explanatory notes that describes primary, secondary, and tertiary amides as containing one, two, or three –CO groups is inconsistent with the government's definition of amide, the more significant point is that it is also inconsistent with Chemtall's definition. That portion

[7] Contrary to Chemtall's argument, the word "may" does not suggest that any number of other groups may be substituted for the hydrogen atom. A statement in a college catalog that "the required Organic Chemistry course may be substituted by Physical Chemistry or Inorganic Chemistry" would not be understood to suggest that the student could also choose to substitute a course in Thermodynamics for the required course in Organic Chemistry.

of the explanatory notes, if adopted, would result in a very narrow interpretation of the term amide that would clearly exclude ATBS.[8]

On the other hand, the examples of cyclic amides that include heteroatoms provide some support for Chemtall's definition of amide that allows "substituted hydrocarbyls." Even those examples, however, may be reconciled with the explanatory notes' definition of amide in light of the structure of heading 2924 of the HTSUS. Unlike the subheadings classifying acyclic amides, the subheadings that concern cyclic amides do not draw a distinction between "Amides" and "Other." For that reason, it maybe that the drafters of the explanatory notes intended for the listed examples of cyclic amides to represent the entire class of cyclic amides and their derivatives, rather than to draw a distinction between an "Amide" and an "Other" compound, as is required for acyclic amides. Accordingly, the examples of cyclic amides containing heteroatoms may actually constitute amide derivatives, which are not classified separately from cyclic amides under the HTSUS.

In any event, although the explanatory notes "provide persuasive guidance" in interpreting the HTSUS, *Schlumberger*, 845 F.3d at 1164, they are "not legally binding and are to be consulted for guidance but not treated as dispositive," *Carl Zeiss*, 195 F.3d at 1378 n.1 (citing H.R. Rep. No. 100–576, 549 (1988)). The inconsistencies in the explanatory notes in this instance render the notes of only limited assistance in interpreting the pertinent subheadings of the HTSUS. For the most part, however, the explanatory notes either support the government's definition of an amide or, at minimum, are inconsistent with Chemtall's definition. We therefore do not find that the explanatory notes provide support for Chemtall that would call for according the term "amide" a broader definition than is suggested by the secondary sources cited above.

IV

Chemtall makes the alternative argument that if ATBS is an amide derivative rather than an amide, it should be classified under the ten-digit classification 2924.19.11.50 for "Other: Amides: Other." That classification would result in a 3.7% duty rate.

[8] The definition of amides as containing one, two, or three –CO groups is not entirely without support. 1 *Van Nostrand's Scientific Encyclopedia* 182–83 (Glenn D. Considine & Peter H. Kulik, eds., 10th ed. 2008), defines a primary amide as an acyl radical (RCO–) linked to an amido group (–NH2); a secondary amide as containing "two acyl radicals and the *imido* group (=NH2)"; and a tertiary amide as containing "three acyl radicals attached to the N atom." *See also* Int'l Union of Pure & Applied Chemistry, *Compendium of Chemical Terminology* 69–70 (2014). That definition is consistent with the structural formulas in the explanatory notes, although it is a much more restrictive definition of the term amide than is found in other texts, and it would exclude ATBS from being considered an amide.

In pressing its "tenth-digit" argument, Chemtall relies on Subheading Note 1 to chapter 29 of the HTSUS. As noted, the subheading note provides that derivatives of a chemical compound are classified in the same subheading as the compound unless they are more specifically covered by another subheading, or there is a residual "other" subheading in the same series of subheadings.

Chemtall argues that, if ATBS is an amide derivative rather than an amide, it must be considered a derivative of acrylamide, which is assigned the statistical suffix 2924.19.11.10. Because the group of statistical suffixes that includes acrylamide also includes the statistical suffix 2924.19.11.50, which is denominated "Other," Chemtall contends that Subheading Note 1 requires that ATBS must be classified under that ten-digit classification.

The first problem with Chemtall's argument is that the tenth-digit statistical suffixes, including the suffixes for acrylamide and "other" amides, are not statutory. *See Pillowtex Corp. v. United States*, 171 F.3d 1370, 1374 (Fed. Cir. 1999) ("[C]lassification of merchandise should not be based upon the wording of statistical suffixes, because statistical annotations, including statistical suffixes, are not part of the legal text of the HTSUS."); *Pima W., Inc. v. United States*, 915 F. Supp. 399, 404 (Ct. Int'l Trade 1996) (The statistical suffixes "are not included among the appropriate references listed in GRI 1 and in the legislative history of the HTSUS."); HTSUS Statistical Note 2 (The legal text of the tariff schedule does not incorporate "statistical suffixes and any article descriptions applicable thereto."). The suffixes provide subdivisions for statistical analysis purposes, but are not intended to change the substantive tariff schedule.

Moreover, Chemtall's proposed application of Subheading Note 1 would subvert the logical structure of the first part of subheading 2924, which applies to "acyclic amides (including acyclic carbamates) and their derivatives [and] salts thereof." Because it is agreed that ATBS does not fall within subheadings 2924.11 or 2924.12, it must fall within subheading 2924.19. The only two statutory subheadings under subheading 2924.19 are subheading 2924.19.11 ("Amides") and subheading 2924.19.80 ("Other"). Because ATBS is not an amide, it must be an amide derivative and thus classifiable under subheading 2924.19.11.80. The four tenth-digit subheadings under subheading 2924.19.11 ("Amides") consist of three specific amides and an "other" category; the four categories are listed at subheadings 2924.19.11.10 through 2924.19.11.50. Because the four tenth-digit categories all fall under subheading 2924.19.11 ("Amides"), a non-amide such as ATBS cannot fall within that subheading or any of its statistical suffixes,

and thus cannot be classified under the tenth-digit suffix 2924.19.11.50 as an "Amide—Other."

For the reasons discussed, the distinction drawn in subheading 2924.19 at the eighth-digit level between "Amides" (subheading 2924.19.11) and "Other" (subheading 2924.19.80) forecloses Chemtall's argument that ATBS, if considered an amide derivative, could still be classified under subheading 2924.19.11 as an "Amide." As is clear from that subheading and the statistical suffixes under that subheading, the residual "Other" category in statistical suffix 2924.19.11.50 is reserved for other amides not specifically listed in statistical suffixes 2924.19.11.10 through 2924.19.11.30. Because an amide derivative, such as ATBS, is not an amide, it is properly classified in subheading 2924.19.80.

AFFIRMED