United States Court of Appeals for the Federal Circuit

ACTELION PHARMACEUTICALS LTD,
Plaintiff-Appellant

v.

MYLAN PHARMACEUTICALS INC.,
Defendant-Appellee

2024-1641

Appeal from the United States District Court for the Northern District of West Virginia in No. 1:20-cv-00110-JPB, Judge John Preston Bailey.

Decided: May 13, 2026

LISA GLASSER, Irell & Manella LLP, Newport Beach, CA, argued for plaintiff-appellant. Also represented by JASON SHEASBY, Los Angeles, CA; PHILIP J. WARRICK, Washington, DC.

ERIC THOMAS WERLINGER, Katten Muchin Rosenman LLP, Washington, DC, argued for defendant-appellee. Also represented by TIMOTHY H. GRAY; JITENDRA MALIK, Charlotte, NC; DEEPRO MUKERJEE, LANCE SODERSTROM, New York, NY; JILLIAN SCHURR-HENDRIX, Dallas, TX.

Before REYNA, TARANTO, and STOLL, *Circuit Judges*.

TARANTO, *Circuit Judge*.

Actelion Pharmaceuticals Ltd owns U.S. Patent Nos. 8,318,802 and 8,598,227, which describe certain pharmaceutical compositions involving epoprostenol. Epoprostenol is the active ingredient in Actelion's hypertension drug Veletri®. Mylan Pharmaceuticals Inc. submitted an abbreviated new drug application (ANDA) to the Food and Drug Administration (FDA) seeking approval to market a generic epoprostenol drug before the expiration of Actelion's patents. Actelion sued Mylan for patent infringement in the Northern District of West Virginia under 35 U.S.C. § 271(e)(2) and 21 U.S.C. § 355(j), alleging that Mylan's proposed generic drug was covered (literally or under the doctrine of equivalents) by certain claims of the '802 and '227 patents. The district court found no literal infringement, concluding, as most relevant here, that the claim term "a pH of 13 or higher" refers to a pH measured at a temperature standard in the field. The district court further ruled that Actelion was barred from asserting, and had not proved, infringement by an equivalent. Actelion appeals. We now affirm.

I

A

The '802 and '227 patents are both titled "Epoprostenol Formulation and Method of Making Thereof." The '227 patent issued from a divisional of the application that issued as the '802 patent, and they share a specification, so we cite only the '802 patent's specification.

Epoprostenol is a vasodilator and antiplatelet agent that can be used to treat cardiovascular disease. It is unstable in water and will react with water molecules to form a different compound that lacks epoprostenol's desirable pharmacological properties. '802 patent, col. 2, lines 41–51; col. 2, line 65, through col. 3, line 51.

The presence of an acid in an aqueous (water-based) solution of epoprostenol rapidly catalyzes this unwanted reaction. Acidic molecules in water can dissociate, introducing hydrogen ions (H^+) into the solution, which are also present as a result of water molecules' own dissociation. Such hydrogen ions often interact with water molecules to form what is represented as a water molecule with an extra hydrogen ion, called hydronium (H_3O^+). These hydrogen ions or hydronium ions facilitate the degradation of epoprostenol in water. As catalysts, they are not consumed by the reaction of epoprostenol with water, so even trace amounts can cause continuing breakdown of epoprostenol. *See* '802 patent, col. 2, line 65, through col. 3, line 51; J.A. 35–36.

The degree of acidity of a solution is commonly expressed using the pH scale. pH is a positive number—the negative of the base-ten logarithm of the concentration of hydrogen ions, that logarithm being a negative number. (For simplicity, we now omit separate mention of hydronium ions.) The higher the concentration of hydrogen ions, the lower the pH. Under standard ambient conditions, including a temperature of 25°C, the pH of pure water is 7, sometimes called neutral pH, with values higher than 7 considered basic and values lower than 7 considered acidic. *See* '802 patent, col. 4, lines 62–64; J.A. 31–32.

The concentration of hydrogen ions in a given solution can be modified in at least two ways. First, one can add acidic or basic compounds to the solution. An acid, as already noted, will introduce more hydrogen ions into a solution (increasing the concentration, thus lowering the pH), and a base will have the opposite effect, reacting with hydrogen ions and neutralizing them (decreasing the hydrogen-ion concentration, thus raising the pH). *See* '802 patent, col. 2, lines 56–57; col. 4, line 62, through col. 5, line 21. Second, one can change the temperature of the solution. Increasing the temperature will cause molecules that are susceptible to liberating hydrogen ions (like water) to

dissociate more frequently, while decreasing the temperature will do the opposite. *See* J.A. 35–36.

Before the priority date of the '802 patent and Actelion's subsequent introduction of Veletri, the FDA approved the marketing of Flolan®, another epoprostenol formulation for intravenous administration. '802 patent, col. 2, lines 41–57. Flolan had three features that mitigated the acid-catalyzed degradation of epoprostenol in water. First, it was stored as a lyophilized (freeze-dried) powder and reconstituted into an aqueous solution (by mixing with liquid diluent) just before it was to be administered. Second, Flolan included a special diluent for reconstituting the freeze-dried powder that was more basic than typical intravenous fluids. Third, the reconstituted solution was refrigerated. *See* '802 patent, col. 3, lines 52–67.

The '802 patent states that Flolan's needs for a special diluent and refrigeration were inconvenient, suggesting the desirability of providing epoprostenol compositions that would be suitably stable even when reconstituted with common commercially available intravenous fluids (which are more acidic than the Flolan diluent) and kept at room temperature (at which hydrogen-ion concentration would be greater than during refrigeration). *See* '802 patent, col. 4, lines 1–19. To that end, the inventor designed processes for making lyophilized epoprostenol compositions that "when reconstituted ha[ve] a pH>11," a pH higher than that of reconstituted Flolan, which is around 10.5. *See* '802 patent, col. 4, lines 20–23; col. 3, lines 52–56; col. 7, line 51, through col. 8, line 57. To achieve such a high pH in the reconstituted solution without using Flolan's basic diluent, the patent discloses creating a highly basic "bulk solution" that includes epoprostenol. The patent discloses adding arginine (a mildly basic amino acid) and sodium hydroxide or other bases to the bulk solution to increase its pH. '802 patent, col. 4, line 62, through col. 5, line 43. The bulk solution is then freeze-dried to yield a powder containing sufficient amounts of basic molecules to provide an

appropriately basic solution when reconstituted with a certain quantity of typical intravenous fluid (*e.g.*, saline). *See* '802 patent, col. 5, line 22, through col. 7, line 30.

A number of experimental results are reported in the specification, showing the stability of the freeze-dried powder forms and, separately, of the reconstituted solution forms of epoprostenol compositions made from bulk solutions with varying pH values (among other differences). *E.g.*, '802 patent, col. 10, line 57, through col. 14, line 37. The patent states that the freeze-dried powder form of "epoprostenol is most stable in . . . formulations when the pH of the bulk solution [is] adjusted to 13," comparing formulations made from bulk solutions with pH 10.5, 11, or 12, and also is more stable than the powder form of Flolan. *See* '802 patent, col. 14, lines 26–37. After reconstitution, as well, epoprostenol compositions made from a pH 13 bulk solution demonstrated desirable room-temperature stability. *See* '802 patent, col. 14, line 39, through col. 18, line 34. Those compositions degraded at about one tenth the degradation rate of reconstituted Flolan kept at a similar temperature. *See* '802 patent, col. 8, lines 34–57. A further benefit of using a pH 13 bulk solution is that the lyophilized composition can be manufactured "without cooling the bulk solution to 5°C," something that "would not be possible for the currently available [Flolan] product because the pH of the [Flolan] bulk solution is 10.5," so that, if unrefrigerated, it quickly suffers "significant degradation." '802 patent, col. 10, lines 48–54.

Despite the ubiquitous references to pH in the specification, and the importance of particular pH thresholds to the invention, the term "pH" is not defined, and the conditions under which pH measurements were taken are not directly stated. *See* '802 patent, Abstract ("[W]hen reconstituted or in solution, the solution has a pH>11."); *id.*, col. 11, lines 54–56 ("[T]he stability of epoprostenol is better at pH 13 compared to lower pH samples.").

The claims of Actelion's patents are product-by-process claims to lyophilized pharmaceutical compositions of epoprostenol or method claims for making compositions or administering reconstituted forms of them. Each independent claim of the patents recites a bulk solution pH of "13 or higher" or "greater than 13." Claim 1 of the '802 patent is representative:

> 1. A lyophilized pharmaceutical composition comprising:
>
> (a) a unit dose of 0.5 mg or 1.5 mg of epoprostenol or a salt thereof;
>
> (b) arginine; and
>
> (c) sodium hydroxide,
>
> wherein said lyophilized pharmaceutical composition is (i) **formed from a bulk solution having a pH of 13 or higher** and (ii) capable of being reconstituted for intravenous administration with an intravenous fluid.

'802 patent, col. 18, lines 46–54 (emphasis added).

B

Mylan submitted its ANDA, No. 213913, to the FDA in February 2020. *See* J.A. 29. The following June, Actelion sued Mylan for infringement of the '802 and '227 patents in the Northern District of West Virginia under 35 U.S.C. § 271(e)(2)(A), alleging that the '802 and '227 patents cover the generic drug that Mylan had sought permission to manufacture and market. *See* J.A. 126. Mylan maintained that its generic was manufactured from a bulk solution with a pH outside the patents' claims. *See* J.A. 253.

The court held a claim-construction hearing and construed the "pH of 13 or higher" term to be subject to "ordinary rounding rules," *i.e.*, to literally encompass pH values as low as 12.5. J.A. 2. The parties stipulated to entry of

final judgment of infringement and a permanent injunction following that ruling, and Mylan appealed. *Id.* In that appeal, we vacated the judgment and remanded for further consideration, ruling that "the proper claim construction cannot be reached without the aid of extrinsic evidence." *Actelion Pharmaceuticals Ltd. v. Mylan Pharmaceuticals Inc.*, 85 F.4th 1167, 1173 (Fed. Cir. 2023). On remand, the district court, after considering both intrinsic and extrinsic evidence, construed "a pH of 13 or higher" to mean "a pH of 12.98 or higher." J.A. 25. That ruling is unchallenged in the present appeal. Actelion Opening Br. at 11–12 n.6.

In February 2024, the issue of infringement was tried to the bench. J.A. 27–28, 139. The court treated claim 1 of the '802 patent as representative, and the "only dispute at trial was whether the pH of the bulk solution used to form Mylan's ANDA product is '13 or higher'" within the meaning of that claim. J.A. 28 (citation omitted), 35. Actelion advanced alternative theories of literal infringement and infringement by an equivalent.

First, Actelion argued, Mylan literally infringed even though it was undisputed that Mylan's bulk solution, when measured at 25±2°C, has a pH well below 12.98. J.A. 48–51. The ANDA indicates that Mylan's bulk solution is refrigerated when it is manufactured, and, according to Actelion, a relevant artisan would understand that pH should be measured at the refrigerated "operating temperature" of the solution, and Mylan's bulk solution, if measured at that cold temperature, has a pH of above 13. Second, Actelion contended that Mylan's generic is an equivalent to the invention because Mylan's manufacturing process performs the same function (improved manufacturing stability) to achieve the same result (composition stability) in the same way (reducing hydrogen ion concentration) as the claimed invention.

The district court rejected both arguments, finding that Mylan does not infringe literally or by an equivalent.

Regarding literal infringement, the court determined that a relevant artisan would understand the "bulk solution having a pH of 13 or higher" term to refer to a pH measurement taken at standard temperature, *i.e.*, 25±2°C. J.A. 34–49, 60–80. The court, looking to the intrinsic record, determined that many of the specification's reported experimental results would "not make sense" if the measurements were not taken at 25±2°C. J.A. 66–73. The court also considered extrinsic evidence, including the United States Pharmacopeia (USP), an influential collection of standards for the pharmaceutical industry, as well as the testimony of the parties' experts, to conclude that in the art, and in the context of the patents at issue, "unless otherwise specified," pH values recited mean the pH measurement at the standard temperature of 25±2°C. J.A. 46 (quoting J.A. 6799); *see* J.A. 35–49. There being no evidence for finding that Mylan's ANDA product had a pH of 13 or higher at that temperature, the court found no literal infringement by Mylan's ANDA product.

Regarding infringement by an equivalent, the district court made three rulings. First, it held that Actelion was barred by the disclosure-dedication rule from capturing bulk solutions with (standard-temperature) pH less than 13, because Actelion's specification discloses, but does not claim, pH ranges for bulk solutions including values under 13, *e.g.*, pH 12–13 and 12.5–13. J.A. 81–82. Second, the court held that, during prosecution, Actelion had, in response to an obviousness rejection, amended the pH limitation to reduce the claimed range to 13 or above, so it had surrendered, and was estopped from attempting to recapture as an equivalent, pH values lower than 13. J.A. 82–85. Finally, the court reasoned that, even taken on its merits, Actelion's equivalents-infringement argument failed, because Actelion had evaluated the function of Mylan's generic and the way it achieves its function "at an impermissibly high level of generality." J.A. 86–87.

The district court entered final judgment on March 18, 2024. Actelion timely appealed. We have jurisdiction under 28 U.S.C. § 1295(a)(1).

II

Actelion makes two primary arguments on appeal. First, challenging the finding of no literal infringement, it contends that the district court erred by construing the claim term "pH of 13 or higher" to refer to a pH measurement made at 25±2°C. Second, Actelion argues that the district court incorrectly held that Actelion was barred from asserting the doctrine of equivalents and that the alternative finding of no proved equivalent was clearly erroneous.

We review the district court's ultimate claim construction and analysis of the intrinsic record without deference, but we review subsidiary findings of fact based on extrinsic evidence for clear error. *Teva Pharmaceuticals USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318, 331–33 (2015). Clear error exists if we are left with "a definite and firm conviction that a mistake has been committed." *Pacific Gas & Electric Co. v. United States*, 668 F.3d 1346, 1350–51 (Fed. Cir. 2012) (cleaned up). A judge's finding of noninfringement is a factual finding that we review for clear error. *Insituform Technologies, Inc. v. Cat Contracting, Inc.*, 161 F.3d 688, 692 (Fed. Cir. 1998). Whether assertion of the doctrine of equivalents is barred by either prosecution history estoppel or the disclosure-dedication rule is a legal issue resolved without deference. *Eli Lilly and Co. v. Hospira, Inc.*, 933 F.3d 1320, 1330–31 (Fed. Cir. 2019); *Eagle Pharmaceuticals Inc. v. Slayback Pharma LLC*, 958 F.3d 1171, 1177 (Fed. Cir. 2020).

A

Actelion argues that the district court's standard-temperature construction of the claim phrase "formed from a bulk solution having a pH of 13 or higher" is incorrect.

According to Actelion, the phrase covers a solution with pH measured at the solution's actual temperature, which might be well below standard temperature; that is the phrase's ordinary meaning to a relevant artisan, Actelion contends, and the district court's construction is contrary to dispositive intrinsic evidence and rests on a clearly erroneous evaluation of the extrinsic evidence. Actelion Opening Br. at 21–36. Mylan, for its part, suggests that the district court did not construe the claim phrase at all, Mylan Br. at 27–43, but that, if it did, its construction was correct, *id.* at 43–48.

Contrary to Mylan's suggestion, we think that the district court did construe the phrase—determining what the phrase meant in the context of the patent and of relevant artisans' understanding. On the other hand, we see no harmful denial to Actelion of notice and opportunity to present arguments and evidence relevant to the phrase's scope, matters that have been fully briefed here. Only the correctness of the district court's determination of the phrase's scope therefore need to be decided. And on the merits, we agree with Mylan that the district court made no reversible error.

The claim language, standing alone, does not resolve the question of the proper interpretation of "a pH of 13 or higher." That phrase, on its face, simply does not specify the conditions for taking the pH measurement necessary to determine whether a bulk solution meets the claims; nor does the remainder of claim 1 or any of the other claims of either patent. *See* '802 patent, col. 18, line 45, through col. 20, line 27; '227 patent, col. 18, line 28, through col. 21, line 31. Actelion points to the word "having" in the phrase "formed from a bulk solution having a pH of 13 or higher," but if a solution's pH would be understood (in the context of the patent and in the art) to be measured at standard temperature, then the phrase means that the bulk solution "ha[s]" the property that its pH, so measured, is 13 or higher. The word "having" does not imply use of a pH

measuring device on a solution as is, with no temperature adjustment of the solution for measurement, or of samples taken from the solution for measurement. *See* J.A. 76, 6938 (indicating use of samples for measurement). The same is true even if, as Actelion insists (in tension with the claim language), what matters is the pH of the solution "during manufacture." *See* Actelion Opening Br. at 26. If pH is understood to be the value for a solution measured at standard temperature, that is the meaning of pH of the solution during manufacture or "when made" (an expression used by the examiner, as indicated *infra*).

With the claim language not supplying a clear answer on its own, we turn to other intrinsic evidence. The specification favors the district court's construction over Actelion's. The specification never states outright the conditions of any of the (many) pH measurements reported in its examples. In particular, when, at the top of the many tables, it lists pH numbers near temperatures, the temperatures are for the storage of samples, not for the measurement of pH. But the specification clearly identifies "an alkaline environment" as one with "pH>7," a definition that undisputedly is accurate only at standard temperature. That identification therefore implicitly conveys an assumption about pH measurements, and that assumption is nowhere contradicted in the specification's many references to pH.

Moreover, the specification consists chiefly of reported results of comparative experiments testing mostly for stability (of powder or of solutions) of old and assertedly new solutions, where, *e.g.*, pH values are being compared. The reports give simple, straightforward comparisons of results for the different listed pH values, without any suggestion of accommodating the complications of measuring pH at different temperatures. The reports are thus more reasonably understood as indicating use of a uniform approach to measuring pH. As it is clear from the expert evidence that at least *some* (even most) of the tables reflect pH measured

at standard temperature, *see* J.A. 36–38, it is inferable that all the pH values are so measured. The specification as a whole therefore provides considerable support for the district court's conclusion that the relevant claim language refers to a pH measurement at standard temperature.

Actelion relies on two additional pieces of intrinsic evidence—the examiner's statement of reasons for allowance and the supposed purpose of the invention—for its actual-temperature reading of the claims, but neither persuasively supports Actelion's construction. The examiner's statement that "the pH of the bulk solution when made imparts a critical function" to the composition, like the claim language itself, is consistent with the idea that pH as claimed means a pH measured at standard temperature. J.A. 4012. On that understanding, the import of the examiner's statement was that raising the pH of the bulk solution by means other than temperature to a certain threshold results in, *e.g.*, the improved stabilities of the powder and reconstituted forms of the composition. That understanding is also consistent with how the specification describes the purpose of the invention. The stated purpose of the invention, relevant here, is to provide a "stable epoprostenol composition," and the specification indicates that the amount of base added to the bulk solution (which would affect the standard-temperature pH), and not the bulk solution's temperature (which, definitionally, would not), is relevant to whether the freeze-dried or reconstituted epoprostenol composition is stable. *See* '802 patent, Abstract; col. 1, lines 11–14; col. 4, lines 8–46; col. 9, line 46, through col. 18, line 34.

For those reasons, the intrinsic evidence favors the district court's construction. In this case, however, we do not stop there, though intrinsic evidence typically resolves claim-construction disputes. Under the general rule that we give a term its ordinary and customary meaning, "the ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary

skill in the art" in the context of the patent, *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc), and on that field-specific-understanding issue, extrinsic evidence—evidence outside the intrinsic record—may sometimes be informative, *id.* at 1318–19; *see Seabed Geosolutions (US) Inc. v. Magseis FF LLC*, 8 F.4th 1285, 1287 (Fed. Cir. 2021); *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1584–85 (Fed. Cir. 1996). Evidence that relevant artisans use a claim term in an established and consistent way, including evidence of a "[w]ell known industry standard[ ]," *see Wellman, Inc. v. Eastman Chemical Co.*, 642 F.3d 1355, 1367 (Fed. Cir. 2011), can be persuasive of the term's meaning, *cf. Canatex Completion Solutions, Inc. v. Wellmatics, LLC*, 159 F.4th 39, 45 (Fed. Cir. 2025). That is so in this case—where the extrinsic evidence strongly reinforces what is already indicated by the intrinsic evidence.

The district court here properly relied on just that sort of extrinsic evidence to find that those skilled in making pharmaceutical compositions, when referring to pH, mean a measurement at standard temperature unless they indicate otherwise, and we discern no clear error in how the district court evaluated the record. The court referred to the USP, which both the parties and their experts agreed is an important set of standards in the pharmaceutical industry. *See* J.A. 32–33 (citing portion of Actelion's expert's trial testimony agreeing that the USP is "influential" and is "consulted" by relevant artisans). The USP, the court found, prescribes a default understanding that, "unless otherwise specified," pH measurements are made at 25±2°C. J.A. 46 (quoting J.A. 6799). The court, further, reasonably found that several general chemistry textbooks support the proposition that "pH values when generally described assume [standard ambient temperature and pressure] measurement." J.A. 47 (citations omitted).

As already noted, moreover, the experts agreed that the vast majority of the pH measurements described in the specification refer to standard-temperature values,

reflecting the default understanding. *See* J.A. 36, 38–42. Indeed, the experts agreed that every reference to a bulk solution with pH 13 in the specification's experimental results conforms to this default—that is, the specification's references to a pH 13 bulk solution undisputedly connote adjusting the temperature of the bulk solution to 25±2°C and then measuring pH as 13. *See* J.A. 36, 38–42; '802 patent, col. 9, line 46, through col. 14, line 37. The district court properly concluded, based on the evidence of an influential industry standard that is undisputedly followed by the most relevant embodiments of the invention, that the term "pH of 13 or higher" refers to a standard-temperature pH measurement.

The contrary evidence marshalled by Actelion does not leave us with a definite and firm conviction that the district court made a mistake. *See* Actelion Opening Br. at 28 (citing J.A. 6021, 4545, 5986, 5950–51). The district court reasonably viewed the USP as more probative of the understanding of a relevant artisan than some of Actelion's evidence, namely "generalized scientific textbooks." *See* J.A. 45. And Actelion's evidence does not actually contradict the district court's finding—that a statement of a pH value in the art is understood to refer to standard-temperature measurements "unless otherwise specified," thus recognizing that a particular statement might specify otherwise. J.A. 46. Actelion's cited evidence merely shows instances of such specification; none of it says that a pH value without identification of a temperature should be assumed to mean anything other than a pH measured at standard temperature. *See* J.A. 6021, 4545, 5986, 5950–51.

Actelion also criticizes the district court's decision as internally inconsistent, but this criticism is unpersuasive. Actelion notes that the court found that the claims "require that the bulk solution have a pH of 13 or higher" and such a "high pH can be achieved through any technique . . . including cold temperature." J.A. 36. We do not read the

district court, in context, to have found that the claims both do and do not require a standard-temperature pH measurement. Instead, we understand the court to have been laying out an undisputed scientific fact about temperature's effect on pH—before it went on, in the next several paragraphs of its decision, to more narrowly interpret the claim language in light of the relevant extrinsic evidence. *See* J.A. 36–38 (observing that "pH measurements, including those of bulk solutions, have a plain and ordinary meaning in pharmaceutical manufacturing" of being taken at "standard temperature").

For all the foregoing reasons, we discern no error in the district court's conclusion that the phrase at issue, as a matter of claim construction, refers to a standard-temperature measurement. Under that construction, there is undisputedly no literal infringement. We therefore affirm the finding that Mylan does not literally infringe.

B

Actelion challenges the district court's determination that Actelion was barred from asserting and also failed to prove that Mylan infringes by an equivalent to the claimed invention. Actelion Opening Br. at 36–61. We discern no error in the district court's application of both the prosecution history estoppel and disclosure-dedication bars and affirm its equivalents-infringement ruling on those grounds.

1

When a patent applicant responds to an examiner's rejection on patentability grounds "by narrowing his claims, this prosecution history estops him from later arguing that the subject matter covered by the original, broader claim was nothing more than an equivalent." *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 727 (2002). Such "a narrowing amendment made for a reason of patentability" presumptively "surrenders the entire territory between the original claim limitation and the

amended claim limitation." *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 344 F.3d 1359, 1365 (Fed. Cir. 2003). Of relevance here, there is a "'very narrow'" exception to such scope of surrender, *Eli Lilly*, 933 F.3d at 1330–31 (quoting *Integrated Technology Corp. v. Rudolph Technologies, Inc.*, 734 F.3d 1352, 1358 (Fed. Cir. 2013)), that applies if the patentee shows "that the way in which the alleged equivalent departs from what the claim limitation literally requires is tangential to the discernible objective reason for the narrowing amendment," *Ajinomoto Co., Inc. v. International Trade Commission*, 932 F.3d 1342, 1354 (Fed. Cir. 2019).

Actelion relies entirely on the tangentiality exception to argue that prosecution history estoppel does not apply here, but its arguments are unpersuasive. The application that issued as the '802 patent was amended during prosecution with respect to the pH limitation several times, with the final amendment that resulted in the claims as allowed narrowing claim 1's pH limitation from "a pH of greater than 12" to "a pH of 13 or higher." *See* J.A. 3981–97. That amendment followed the examiner's rejection of the claims, on obviousness grounds, because no "unexpected results" had been demonstrated for "a bulk solution having a pH of 12 or greater," together with the examiner's indication that claims "limited to using a bulk solution with a pH of 13 or higher" would be allowable because, for those bulk-solution pH values, unexpected results had been shown. J.A. 3982. Referring to the stabilities of the freeze-dried powder and reconstituted solution, the examiner further noted that the applicant had not shown improved stability for "a pH of greater than 12," J.A. 3983, and "it is the lack of stability at even pH [ ] 12 which demonstrates the significance of [ ] pH 13," J.A. 3984.

Actelion contends that the claim amendment comes within the tangentiality exception because the rationale for the amendment was not to surrender a "functionally equivalent bulk solution having the same relevant chemical

properties" and "identical benefits," namely "impact on epoprostenol degradation." Actelion Opening Br. at 56. That contention is incorrect. The prosecution history demonstrates that the examiner viewed pH 13 as the threshold for which unexpected results, necessary for nonobviousness here, had been shown: That is the "discernible objective reason for the narrowing amendment." *Ajinomoto*, 932 F.3d at 1354. We thus agree with the district court that Actelion failed to show that the claim amendment is only tangential to the differences between the alleged equivalent and the literal claim scope, and we conclude that Actelion is estopped from asserting the doctrine of equivalents here.

2

The disclosure-dedication rule independently bars Actelion's theory of infringement by an equivalent. "[W]hen a patent drafter discloses but declines to claim subject matter," the patentee "dedicates that unclaimed subject matter to the public" and cannot recapture it as an equivalent. *Johnson & Johnston Associates Inc. v. R.E. Service Co.*, 285 F.3d 1046, 1054 (Fed. Cir. 2002) (en banc). "[T]he disclosure must be of such specificity that one of ordinary skill in the art could identify the subject matter that had been disclosed and not claimed." *SanDisk Corp. v. Kingston Technology Co.*, 695 F.3d 1348, 1363 (Fed. Cir. 2012) (quoting *PSC Computer Products v. Foxconn International, Inc.*, 355 F.3d 1353, 1360 (Fed. Cir. 2004)). And the "unclaimed subject matter must have been identified by the patentee as an alternative to a claim limitation." *Id.* at 1364 (quoting *Pfizer, Inc. v. Teva Pharmaceuticals USA, Inc.*, 429 F.3d 1364, 1379 (Fed. Cir. 2005)).

Actelion's patents disclose that "[t]he pH of the bulk solution is preferably adjusted to about 12.5–13.5, most preferably 13." '802 patent, col. 5, lines 41–43; *see id.*, col. 5, lines 35–37 ("Preferably, the base is added so that the pH of the bulk solution is greater than 11, preferably greater

than 12, and, most preferably greater than 13."). Those disclosures are sufficiently specific to identify the ranges of pH 12.5 to 13, 12 to 13, and greater than 12. Moreover, those disclosures plainly correspond to, and are expressly identified as alternatives to, the claim limitation requiring a pH of 13 or higher. *Id.*, col. 5, lines 36–37 ("preferably greater than 12, and, most preferably greater than 13"). Actelion cites no support in our case law for its suggestion that the disclosure-dedication rule should not apply here because the disclosed alternatives are not mutually exclusive with each other. And that suggestion is contrary to the purpose of the rule, which, consistent with ordinary principles of claim interpretation, seeks to give effect to how relevant artisans would understand what has, and more importantly what has *not*, been claimed. That principle does not require that the disclosed alternatives be mutually exclusive; overlapping alternatives are readily susceptible of being clearly disclosed and yet partially unclaimed. *See Johnson & Johnston*, 285 F.3d at 1054. We therefore agree with the district court that the disclosure-dedication rule bars Actelion's assertion of the doctrine of equivalents, and we affirm the district court's decision on that ground, as well.

III

We have considered Actelion's remaining arguments and find them unpersuasive. For the foregoing reasons, we affirm the judgment of the district court.

AFFIRMED