

**UNITED STATES DISTRICT COURT  
FOR THE WESTERN DISTRICT OF OKLAHOMA**

**FLEX-CHEM HOLDING  
COMPANY, LLC,**

**Plaintiff,**

**VS.**

**PHARAOH ENERGY SERVICES,  
LLC**

**Defendant.**

**Case No. CIV-23-316-JD**

**DEFENDANT PHARAOH ENERGY SERVICES, LLC'S  
REPLY CLAIM CONSTRUCTION BRIEF**

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In its Responsive Claim Construction Brief, Flex-Chem Holding Company, LLC advocates for an expansive claim scope that is divorced from the confines of the claim language, specification, and prosecution history. Flex-Chem urges this Court to disregard the intrinsic record, asking for a significant expansion of the scope of the claims at issue. Pharaoh Energy Services, LLC, on the other hand, proposes a substantially different approach—i.e., asking the Court to adopt constructions guided by the intrinsic evidence and aligned with the narrowly defined inventions described in the Asserted Patents. The terms of the presently disputed claims are not merely "ordinary, English" words but include technical jargon of a highly specialized chemical and petroleum engineering field.

**Metals.** Flex-Chem proposes “metals” does not need to be construed, advocating for the inclusion of **all metals without any limitations**, arguing that the term is common and understandable to a person of ordinary skill in the art (POSITA) and jurors, despite the claim language explicitly requiring the metals to be "naturally-occurring." [Dkt. No. 43, p. 5]. Although Pharaoh does not dispute that the term “metal(s)” can be commonly used, that is not the case here. Indeed, its commonality does not eliminate the definitional constraints Flex-Chem itself ascribed to this term in the specifications of the Asserted Patents. Indeed, in looking at the specifications, it is plain that Flex-Chem described its claimed invention and, consequently, the term “metal” in a manner for which an accurate claim construction must be considered. The mere supposed commonality of the term in general parlance does not negate the necessity to consider and apply Flex-Chem’s limitations on the scope of the term within the highly technical chemical and petroleum engineering context.

Flex-Chem further argues against the construction of the term “metals,” citing *Superior Indus., Inc. v. Masaba, Inc.*, 553 F. App'x 986, 989 (Fed. Cir. 2014), for the proposition that rendering a construction that does not affect the infringement analysis may amount to an improper advisory opinion. [See Dkt. No. 43, p. 6]. However, *Superior Indus.*, is wholly inapposite here, as it pertains to the appellate review of an order granting summary judgment of non-infringement where the district court’s “summary judgment opinion and order d[id] not explain how its construction of any term would affect Superior’s infringement claims.” 553 F. App'x at 989 (emphasis added). Flex-Chem baldly asserts that the term “metals” does not “actually affect” the infringement analysis, claiming without any substantiating evidence, that “[w]hen Defendant injects its treatment mixture into the well, there is no doubt that metals, even if construed as Defendant desires, are bound to that treatment mixture.” [Dkt. No. 43, p. 6]. Flex-Chem **fails to provide any** supporting factual evidence to establish the veracity of that statement nor does it explain why this statement, even if it were to be taken as true, would affect the need to define the term “metals” as used within the claim. Flex-Chem acknowledges that “[t]he treatment mixture binds with the metals **from the shale formation** that have become part of the sludge.” *Id.* at 6 (emphasis added). At a minimum, “metals” must be limited to those naturally occurring within a shale formation.

Further, the specifications of the Asserted Patents, particularly, the '843 and '575 Patent’s provide: “the introduction of hydraulic fracturing fluids and/or acid treatments that release metal ions through their interaction with the formation materials, such as aluminum, barium, calcium, magnesium, manganese, iron, strontium, boron, and other metals or

metalloids.” [Dkt. 42-1 at 4:33–38 and Dkt. 42-2 at 4:35–40]. Flex-Chem concedes that these listed metals align with Pharaoh’s proposed construction. Yet, it continues to argue that Pharaoh aims to import a non-exhaustive list from the specification into the claims [Dkt. No. 43, p. 8] and points to the phrase “such as” preceding the enumeration of metals as evidence of a non-exhaustive list. *Id.* Pharaoh agrees that the listed metals constitute a non-exhaustive list, which Pharaoh considered in proposing a definition for “metals” that encompasses all enumerated examples.

Next, Flex-Chem points out that potassium and sodium were identified as part of the preferred methods in the ’843 and ’575 Patents. [See Dkt. No. 43, p. 8]. Pharaoh unintentionally overlooked these metals in providing its proposed definition. As such, Pharaoh agrees that its definition should also include alkali metals, such as sodium and potassium. Conversely, Flex-Chem has not and cannot provide analogous instances where the specifications mention rare earth metals or any constituents thereof. Given this lack of disclosure surrounding rare earth metals, it is plain that the construction of the term “metals” cannot be so broad as to include all categories of metals. In light of Flex-Chem’s comments regarding alkali metals, Pharaoh revises its proposed definition of “metals” to be “naturally occurring metal ions from the **alkali metals (IA)**, alkaline earth metals (IIA), transition metals (IIIB to IB), and post-transition metals (IIB to IIIA).”

Flex-Chem inexplicably refers to the following language of **draft** claim 21 of the ’282 Patent: “the metal of the subterranean-formed metal-polymer complex including metal naturally present within the subterranean formation.” [Dkt. No. 43, pp. 9–10]. Flex-Chem correctly notes that “including” is a non-limiting term, but overlooks that it neither

excludes nor mandates the presence of non-naturally occurring metals. Further, as a draft claim that was not allowed nor issued, the relevance of what the claim attempted to but ultimately was unsuccessful in covering is immaterial.

**pH Modifier.** Pharoah’s proposed construction for the term “pH modifier” is “hydrochloric acid.” Flex-Chem suggests that no construction is required, claiming that several acids can serve as pH modifiers but fails to set forth any limitation or guardrail to the breadth of the claim. Specifically, Flex-Chem argues that the term “pH modifier” should have a broader construction than proposed by Pharaoh, noting the claim language mentions “one or more acids as a pH modifier.” [See Dkt. No. 43, p. 11]. Although the claim language may allow for the potential use of multiple acids as a “pH modifier,” the phrase “one or more acids” inherently encompasses the option of using a single acid. In fact, the preferred embodiments of the Asserted Patents use only a singular acid—specifically, hydrochloric acid—which supports Pharaoh’s construction of the term “pH modifier.” [Dkt. No. 42-1, 14:5–14 and 14:47–57; Dkt. No. 42-2, 13:11–14:6 and 14:32–42]. Flex-Chem chose to enable only a single species of pH modifier (i.e., hydrochloric acid) and should not now be able to claim a genus that includes any acid that can act as a pH modifier. *See In re Curtis*, 354 F.3d 1347, 1358 (Fed. Cir. 2004) (holding that the disclosure of a single species is not sufficient to support an entire genus when “the evidence indicates ordinary artisans could not predict the operability in the invention of any species other than the one disclosed.”). Here, Flex-Chem seeks to broaden the scope of the term “pH modifier” to include the genus “acids.” However, the Asserted Patents fail to identify

a sufficiently representative number of specific acid species to support disclosure of the totality of the genus and relies only on a single working example: hydrochloric acid.

**Induced Fractures.** Pharaoh’s proposed construction for the term “induced fractures” is “flow paths within the formation that were created by fracking fluids during the hydraulic fracturing process,” which is supported by the intrinsic record. Flex-Chem argues that no construction is necessary and criticizes Pharaoh for seeking to use sixteen words to construe a two-word, allegedly non-technical term. [Dkt. No. 43, p. 13]. The term “induced fractures,” however, is not in the lexicon of everyday usage and, more importantly, the term holds specific technical relevance to POSITA within the context of the Asserted Patents. Flex-Chem yet again accuses Pharaoh of attempting to import limitations not present in the claim language. On the contrary, as discussed in Pharaoh’s opening brief, the claim language substantiates Pharaoh’s proposed construction. [See Dkt. No., p. 14]. Flex-Chem baldly asserts that “the fact that the treatment mixture is injected in combination with hydraulic fracturing does not require that the fracturing fluids created the induced fractures and does not require that the fractures be created as part of the fracturing process.” [Dkt. No. 43, p. 14]. However, Flex-Chem does not even address the arguments in Pharaoh’s opening brief. *Id.*; *see also* Dkt. No. 42, p. 15.

Instead, Flex-Chem argues the term “induced fractures” is used in its ordinary sense in the specification and does not warrant construction because “[t]he words ‘induced’ and ‘fractures’ are both common, English words that the jury will be familiar with and will understand.” [Dkt. No. 43, p. 14]. Addressed *supra*, the commonality and familiarity of a particular word do not render claim construction unnecessary. Also, while a jury’s

understanding is important, it does not replace the need for clarity in claim construction from the perspective of a POSITA—especially when a word is used in a technical setting and not in some common, generally held sense. Construction of the technical term “induced fractures” is necessary, and the specification supports Pharaoh’s proposed construction.

**Fracture Pressure.** Pharaoh’s proposed construction for the term “fracture pressure” is “the pressure at which the formation rock splits, creating new flow paths therein,” which is supported by the intrinsic record. Flex-Chem argues that no construction is necessary for this term because the term uses common, English words, which a POSITA and the jury will understand. Again, the commonality of a term does not render claim construction unnecessary. Flex-Chem fails to explain why “fracture pressure” is not a technical term requiring construction or what it means to a POSITA.

Flex-Chem further claims that Pharaoh points to nothing that suggests the term “fracture pressure” has been given a special definition or used in a manner that requires construction. [Dkt. No. 43, p. 16]. However, Pharaoh pointed out that “[t]he claim language refers to the injection of the metal-polymer remediation mixture into the well at **a pressure less than the ‘fracture pressure’** of the formation.” [Dkt. No. 42, p. 16 (emphasis added)]. The use of both "pressure" and "fracture pressure" implies a specialized meaning within the Asserted Patents. Specifically, "fracture pressure" is not a common understanding of pressure but is linked to the characteristics of a specific formation, like the nano-darcy. The claim language explicitly sets a unique pressure threshold for a specific shale formation, thereby giving the term "fracture pressure" a specialized definition.

Flex-Chem further claims that nothing in the specification suggests that the term “fracture pressure” is being used in a manner that differs from its plain and ordinary meaning. [Dkt. No. 43, p. 16]. Although Flex-Chem claims that no construction is necessary, Flex-Chem agreed that to the extent construction is necessary, the term should be construed consistent with the explanation provided in the specification: “the pressure required to substantially fracture the formation.” *Id.* at 17. If the Court is inclined to entertain this definition proposed by Flex-Chem, Pharaoh does not object, at this stage, to its adoption, subject to the caveat that Pharaoh’s position is contingent upon the term’s definiteness, and explicitly reserves the right to raise indefiniteness. *See Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1251 (Fed. Cir. 2008) (“Even if a claim term's definition can be reduced to words, the claim is still indefinite if a person of ordinary skill in the art cannot translate the definition into meaningfully precise claim scope.”).

**Shale Formation.** Pharaoh’s proposed construction for the term “shale formation” is “a mixture of clay minerals and larger particles, wherein the clay minerals are not normally spherically shaped and exhibit electro-static properties.” Flex-Chem contends no construction is necessary for the term “shale formation” because it is a “common term of art used in its ordinary sense in the Asserted Patents.” [Dkt. No. 43, p. 17]. While Flex-Chem asserts that no construction is required, it seemingly proposes a construction of the term by pointing to a prior art reference, which states, in part, that shale formations “contain very fine particles of many different clays covered with organic materials to which gas and/or oil are adsorbed.” *Id.* With regard to Pharaoh’s construction, Flex-Chem questions: “[w]hy would the jury be able to understand ‘electro-static

properties’ but not ‘shale formation?’” *Id.* at 18. Although rhetorical, this inquiry belies a misunderstanding of the claim construction framework. Specifically, Flex-Chem fails to appreciate that in claim construction, “[a] court construing a patent claim seeks to accord a claim the meaning it would have to **a person of ordinary skill in the art** at the time of the invention.” *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1116 (Fed. Cir. 2004) (emphasis added). Testimony of a POSITA or a technical expert can explain the meaning of the term “electro-static properties.” Finally, a POSITA, having read the specification, would understand the term “shale formation” to mean “a mixture of clay minerals and larger particles, wherein the clay minerals are not normally spherically shaped and exhibit electro-static properties.” This language is extracted verbatim from the specifications of the Asserted Patents—i.e., it is the definition that Flex-Chem gave the term when drafting the applications that resulted in the Asserted Patents. [Dkt. No. 42-1, 1:30–32; Dkt. No. 42-2, 1:33–35; Dkt. No. 42-3, 1:38–40]. Given its choice to define “shale formation,” Flex-Chem cannot now distance itself from that definition.

Finally, Flex-Chem argues that the prosecution history’s general silence with respect to the term “shale formation” requires a broad construction of the term. In support, Flex-Chem cites *ACTV, Inc. v. Walt Disney Co.*, 346 F.3d 1082, 1092 (Fed. Cir. 2003), which found, where the prosecution history was generally silent with respect to a disputed limitation, “the prosecution history does not inform a definition other than the ordinary and customary meaning of the term.” *Id.* As discussed above, there was no need to discuss the definition of “shale formation” during the prosecution history as Flex-Chem ascribed a specific and detailed definition to this term.

**Nano-Darcy Shale Formation.** Pharaoh’s proposed construction for the term “nano-darcy shale formation” is “an oil or gas-bearing shale formation with a permeability to injected fluids of less than 100 nanodarcies.” Flex-Chem argues that no construction is warranted for this highly technical term, presumably believing it is within the lexicon of an ordinary juror. Flex-Chem first argues that “[n]othing in the claim language supports Defendant’s attempt to limit ‘nano-darcy shale formation’ to a particular permeability.” [Dkt. No. 43, p. 21]. However, the claim language itself indicates the claimed method’s success in enhancing hydrocarbon production depends on the permeability of the nano-darcy shale formation. [See Dkt. No. 42-1, at 19:10–16]. The term “**nano-darcy**” also suggests a permeability level below what is considered as darcy permeability. As such, the claim language supports Pharaoh’s claim construction.

Further, Flex-Chem accuses Pharaoh of improperly reading limitations from the specification into the claim and contends that these purportedly imported limitations are inconsistent with the specifications. [Dkt. No. 43, p. 21]. Flex-Chem’s assertion is puzzling as the specification of the ’843 Patent specifically provides that “[n]ano-darcy shale formations refer to those shale formations having an average permeability in at least one direction of less than 1 micro-darcy or less than  $1 \times 10^{-6}$  darcy,” equivalent to 1,000 nanodarcies. [Dkt. No. 42-1, 1:14–17]. Pharaoh’s proposed construction aligns perfectly with the definition Flex-Chem gave this term in the specification—as the permeability of a nano-darcy shale formation is defined as being **less than** 1,000 nanodarcies.

Finally, Flex-Chem again argues that because the prosecution history is generally silent regarding “nano-darcy shale formation,” no construction is needed because there is

no clear disavowal of claim scope. [Dkt. No. 43, p. 22]. As discussed above, the lack of discussion of the term in the prosecution history is unsurprising given Flex-Chem chose to provide the term a very specific definition in the specifications of the Asserted Patents—the very same definition Pharaoh urges the Court to adopt for this term.

**Metal-Polymer Complex.** Pharaoh’s proposed construction for the term “metal-polymer complex” is “a structure formed subterraneously by in-situ crosslinking or complexing of metal ions with fracturing fluid polymer molecules in a shale formation,” which is supported by the intrinsic evidence. Flex-Chem once again argues that no construction is warranted for this highly technical term. Flex-Chem’s argument appears to be that Pharaoh’s proposed construction would render the claim language redundant, yet fails to provide any support for that claim. As one of the main improvements and alleged intended outcomes of the claimed invention, the term “metal-polymer complex” is wholly crucial to understanding the scope and breadth of the claim term. As outlined in Pharaoh’s opening brief [Dkt. No. 42, pp. 22–25], the term “metal-polymer complex” circumscribes the very specific and supposedly intentional outcome of a specific chemical process—i.e., *in-situ* metals interacting with the fracturing fluid within the shale formation. Indeed, the definition urged by Pharaoh is the one given the term by Flex-Chem in the specification of the Asserted Patents. [See Dkt. No. 42-3, 4:21–25; 4:37–41].

### **CONCLUSION**

Pharaoh respectfully requests that the Court adopt its proposed constructions as addressed above and in its opening claim construction brief [Dkt. No. 42].

Dated: January 11, 2024

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**CERTIFICATE OF SERVICE**

I certify that on January 11, 2024, I electronically transmitted the foregoing document to the Clerk of the Court using the ECF system for filing and transmittal of a Notice of Electronic Filing to the following ECF registrants:

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