Xerogel thermite refers to **a thermite reaction where the metal oxide and metal powder components are incorporated into a xerogel matrix, a solid material formed by drying a gel, enhancing the reaction's properties**. [[1](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering), [2](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303293), [3](https://www.sciencedirect.com/topics/physics-and-astronomy/xerogel), [4](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)]

**Here's a more detailed explanation: [**[**2**](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303293)**,** [**3**](https://www.sciencedirect.com/topics/physics-and-astronomy/xerogel)**,** [**5**](https://pmc.ncbi.nlm.nih.gov/articles/PMC10297286/#:~:text=Xerogels%20are%20solid%20materials%20derived%20from%20gels,liquid%20phase%2C%20leaving%20behind%20a%20solid%20material.)**,** [**6**](https://www.sciencedirect.com/topics/chemical-engineering/xerogel)**]**

**What is a xerogel?**

Xerogels are solid materials derived from gels by removing the liquid phase through drying, resulting in a porous structure with high surface area. [[2](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303293), [3](https://www.sciencedirect.com/topics/physics-and-astronomy/xerogel), [5](https://pmc.ncbi.nlm.nih.gov/articles/PMC10297286/#:~:text=Xerogels%20are%20solid%20materials%20derived%20from%20gels,liquid%20phase%2C%20leaving%20behind%20a%20solid%20material.), [6](https://www.sciencedirect.com/topics/chemical-engineering/xerogel)]

**What is thermite?**

Thermite is a mixture of a metal oxide (oxidizer) and a metal powder (fuel) that, when ignited, undergoes a highly exothermic reaction, producing intense heat and molten metal. [[1](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering), [4](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)]

**Xerogel Thermite:**

By incorporating the thermite components into a xerogel matrix, the reaction's properties can be modified. For example, the porous structure of the xerogel can increase the surface area available for the reaction, potentially enhancing the reaction rate and efficiency. [[1](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering), [2](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303293), [3](https://www.sciencedirect.com/topics/physics-and-astronomy/xerogel), [4](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)]

**Examples of Xerogel Thermite: [**[**1**](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering)**,** [**7**](https://www.sciencedirect.com/science/article/abs/pii/S1226086X12001426#:~:text=At%20Al/Fe%20ratio%20of%202%2C%20thermite%20reaction,amount%20stored%20chemical%20energy%20that%20can%20be)**]**

* Al/Fe2O3 xerogel nanocomposites [[1](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering), [7](https://www.sciencedirect.com/science/article/abs/pii/S1226086X12001426#:~:text=At%20Al/Fe%20ratio%20of%202%2C%20thermite%20reaction,amount%20stored%20chemical%20energy%20that%20can%20be)]
* Metal-iron oxide nano-composites [[4](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)]
* Nano-composite thermites containing metal and sol-gel synthesized iron oxide xerogels [[8](https://arc.aiaa.org/doi/10.2514/6.2021-3337)]

**Benefits of using xerogels in thermite reactions: [**[**1**](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering)**,** [**2**](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303293)**,** [**3**](https://www.sciencedirect.com/topics/physics-and-astronomy/xerogel)**,** [**4**](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)**]**

* Enhanced reaction rate and efficiency [[1](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering), [2](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303293), [3](https://www.sciencedirect.com/topics/physics-and-astronomy/xerogel), [4](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)]
* Increased surface area for reaction [[1](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering), [2](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303293), [3](https://www.sciencedirect.com/topics/physics-and-astronomy/xerogel), [4](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)]
* Potential for controlled combustion and energy release [[1](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering), [2](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303293), [3](https://www.sciencedirect.com/topics/physics-and-astronomy/xerogel), [4](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)]

**Applications: [**[**1**](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering)**,** [**7**](https://www.sciencedirect.com/science/article/abs/pii/S1226086X12001426#:~:text=At%20Al/Fe%20ratio%20of%202%2C%20thermite%20reaction,amount%20stored%20chemical%20energy%20that%20can%20be)**]**

* Energetic materials [[1](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering), [7](https://www.sciencedirect.com/science/article/abs/pii/S1226086X12001426#:~:text=At%20Al/Fe%20ratio%20of%202%2C%20thermite%20reaction,amount%20stored%20chemical%20energy%20that%20can%20be)]
* Combustion performance testing [[4](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)]
* Thermal behavior studies [[1](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering)]
* High-temperature applications [[9](https://www.nature.com/articles/s41598-022-12204-6)]
* Space exploration [[9](https://www.nature.com/articles/s41598-022-12204-6)]

*Generative AI is experimental.*

[1] [https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561](https://www.sciencedirect.com/science/article/abs/pii/S1226086X13001561#:~:text=The%20thermite%2C%20the%20mixture%20of%20a%20metal,thermites%20have%20been%20utilized%20to%20many%20engineering)

[2] <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303293>

[3] <https://www.sciencedirect.com/topics/physics-and-astronomy/xerogel>

[4] [https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337](https://arc.aiaa.org/doi/pdf/10.2514/6.2021-3337#:~:text=Fuel%20rich%20thermite%20compositions%20were%20prepared%20by,energetic%20properties%20of%20the%20nano%2Dcomposites%20were%20evaluated)

[5] [https://pmc.ncbi.nlm.nih.gov/articles/PMC10297286/](https://pmc.ncbi.nlm.nih.gov/articles/PMC10297286/#:~:text=Xerogels%20are%20solid%20materials%20derived%20from%20gels,liquid%20phase%2C%20leaving%20behind%20a%20solid%20material.)

[6] <https://www.sciencedirect.com/topics/chemical-engineering/xerogel>

[7] [https://www.sciencedirect.com/science/article/abs/pii/S1226086X12001426](https://www.sciencedirect.com/science/article/abs/pii/S1226086X12001426#:~:text=At%20Al/Fe%20ratio%20of%202%2C%20thermite%20reaction,amount%20stored%20chemical%20energy%20that%20can%20be)

[8] <https://arc.aiaa.org/doi/10.2514/6.2021-3337>

[9] <https://www.nature.com/articles/s41598-022-12204-6>