

Make Your Own Xanthan Gum Hair Gel

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Xanthan gum is found in many products, including food items, cosmetics and personal care products. It also appears in many shampoos, conditioners and styling agents. Its current popularity can in part be attributed to its plant-based origins and biodegradability. Home-based kitchen chemists who formulate their own products have found it to be a useful and easy-to-use additive for hair gels and conditioners.

What exactly is this material, though? Its name does not reveal much information regarding its chemical nature or its purpose in a product.

XANTHAN GUM'S CHEMICAL STRUCTURE

Xanthan gum is a naturally derived polymeric carbohydrate (polysaccharide) with a very high molecular weight (in the millions of grams per mole). It is obtained via a fermentation process utilizing the bacterium *Xanthomonas campestris*, which can be obtained from a variety of plant-based sources.

The polymer backbone is comprised of repeating units of a simple sugar molecule (beta - (1,4) D-glucose), and the side chains pendant to the backbone are trisaccharides, made up of alpha-D-mannose, beta-D-glucuronic acid, and beta-D-mannose paired with a pyruvate group. The side chains possess an anionic (negative) charge, and they make up the bulk of the weight of the polymer, and thus contribute the majority of the properties for which Xanthan gum is prized.

XANTHAN GUM'S PHYSICAL PROPERTIES

Xanthan gum is readily soluble in either hot or cold water. It is generally unaffected by pH, is very tolerant of electrolytes, and is stable over a wide range of temperatures. These properties make it extremely easy to work with both in formulation and production.

Xanthan gum is most often used for its unique rheological (affecting the flow of the liquid) properties. In both neutral and charged solutions, it imparts higher viscosity to the formula, making it thicker and more resistant to flow. In a neutral solution, the polymer molecules are in the random coil state, and thickening is achieved primarily via chain entanglements between the very long polymers. Imagine a mass of spaghetti noodles all piled together in a bowl and how they all become intertwined with one another.

In solutions containing electrolytes, the polymer molecules collapse and form somewhat rigid helical rods that can pack together and form gel networks via hydrogen bonding. Polymers that form gels when mixed with water like this are called hydrocolloids. These gels are stable over a wide range of temperatures. Also, since the polymers are completely soluble in the aqueous solution, the subsequent gels formed are very clear, which is a highly desirable property in the styling product market.

Hydrocolloid gels made with xanthan gum are pseudoplastic materials, meaning that the viscosity of these solutions undergoes shear thinning (decreases) when a shear force is applied. This makes it easier for the fluid to move or flow when it is shaken, stirred, or squeezed. What happens is that the forces break down the gel network so that the individual polymer molecules can slide past one another.

This is a great advantage both for processing the materials as well as for application as a finished good. Shear thinning reduces the effort required to squeeze or pump gel or lotion out of a bottle or toothpaste from a tube,

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PRODUCTS



Xanthan gum is useful in shampoos, hair conditioners and styling products. It is a fantastic viscosity modifier, producing thick and creamy products that are very thermally stable. Its shear thinning properties also make it easy for the consumer to use. It is stable over a broad range of temperatures, is water-soluble and is a great binder of water.

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It is also an excellent emulsion stabilization agent, which facilitates incorporation and prevents phase-separation of oil-based additives. It is compatible with anionic, cationic, and nonionic polymers.

The application in which xanthan gum's properties really shine is in the styling gel. Xanthan gum dissolves completely, and so the gel formed is sparkling clear, which is a property highly desired by consumers. It is highly compatible with typical styling polymers, such as the cationic polyquaternium family, as well as the acrylates. It has been found to enhance the performance when used in products with these polymers, decreasing the amount of expensive synthetic polymer needed for a good result.

One producer of the polymer, National Starch, found that the polymer has extraordinarily good properties all by itself in water, as a hair fixative material. A simple formula containing water, xanthan gum (1 to 3%, by weight), and appropriate preservatives was found to provide a product with excellent rigidity of style, high gloss, insignificant flaking, good feel, and to have curl retention in high humidity that exceeded many traditional commercial products. What this means is that a styling gel containing xanthan gum will provide a curly style with excellent hold with no white, flakey mess, and that the style will stand up to heat, humidity, and time.

What an awesome material for the curly girl who desires to make her own products!

MAKE YOUR OWN XANTHAM GUM GEL!

What You'll Need

- Xanthan Gum: 1.5% w/w
- Water: Q.S.
- Preservative: Q.S.

Q.S. means "quantity sufficient," and just means to use the amount you need to get the right percentages for your product.

1. **First add the preservative** to water and mix thoroughly.
2. **Add in the xanthan gum slowly**, with lots of stirring or agitation, into cold or heated deionized water until the solution is clear and begins to thicken.
3. **Pour into containers** and set aside to allow gel network to form.
4. **Experimentation with the addition of essential oils**, other polymers, small quantities of salt (if you want a thicker gel), or plant oils can help personalize this product to your own tastes.

Want More?

Interested in making your own products, but worried about mishandling them once you insert the chemicals? The Curl Chemist explains [how to handle diluted and homemade products!](#)

FINAL THOUGHTS

Overall, xanthan gum seems to be a win-win material. It is water soluble, which allows curlies all around to sigh in relief. It gives products that luxuriously thick texture and feel, stabilizes formulations so that all the ingredients can work as intended, and it adds excellent hold to styling products such as gels and mousses. In addition, the ease with which it can be used to create a product at home makes it a very attractive ingredient indeed.

The single caveat for potential consumers to be aware of is that it can sometimes be an allergenic material, as it is typically derived from wheat, corn, or soy. Fortunately, it is possible to obtain xanthan gum from the source of your preference. For instance, Bob's Red Mill makes a certified organic food grade xanthan gum derived from non-GMO corn and soy products.



scientist and cosmetic chemist whose academic and industrial research experience have provided her with expertise in the fundamentals and applications of polymer science and colloid chemistry. She has long had a fascination with the structure-property relationships of the complex solutions used in hair and skin care products, and how they interact with and impact these remarkable biological substrates. Ever curious, Tonya has dedicated herself for more than a decade to honing her expertise on the science of curly hair, how it differs from straight hair, and how product ingredients used on curly hair affect its health and beauty. Her passion for sharing this knowledge with others has led to her current career of educating people from all backgrounds who share an interest in this exciting field.

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