

## Abstract

Hair Building Fibres are becoming the most commonly used method of concealing thinning hair. They can be applied on a daily basis and are easily washed off, therefore they require very little commitment, and so are a viable and flexible alternative to the investment involved in hair replacement systems. The other main alternative has been an array of sprays and creams to conceal the scalp. Whilst some of these are effective, none give the perfect looking hair density that hair building fibres can achieve.

In fact, certain hair building fibre products make such a difference and appear so natural that some people without thinning hair are starting to look to these as an addition to the existing market of thickening conditioners, hair extensions and styling aids.

Whilst hair building fibres are without doubt the future of hair concealing products, they are not without their drawbacks. There are a variety of factors that have negative effects on the appearance of the fibres when they are applied, these ruin the client's experience of using the product. These issues and the experiences they create must be overcome as hair building fibres become increasingly popular and widely used.

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## Introduction

Thinning hair is not the niche market it was years ago. Growing public awareness has led to a new perspective on the various forms of hair loss, and consequently approaches to treating the condition. Thinning hair is increasingly regarded as an important target for cosmetic and aesthetic treatment, much like skin ageing. Consumers require an elegant, subtle solution that requires little commitment, but most importantly will not cause further distress.

Hair Building Fibres are in many ways the ideal answer and so are becoming increasingly popular. Simply shaken onto a thinning area, the fine coloured fibres aim to bind to hair and so make each natural hair look thicker, resulting in an overall thicker appearance. The fibres can be reapplied daily and are easily washed out, they are also inexpensive compared to many other solutions and so require very little investment.

Despite this there are a number of drawbacks and minor problems with hair fibre products generally. Avoiding embarrassment of any sort is paramount for clients, if they have one negative experience with one of these products they will not use them again, and so a reliable solution to these problems is essential.

## Safety and Comfort

Hair Building Fibres were originally designed to conceal hair loss for people suffering from various forms of Alopecia. This was mostly Androgenetic Alopecia, commonly known as "Male pattern baldness" although it affects women as well. Because of this, most users today have some form of thinning hair, and are therefore very sensitive to products and cannot use ones that cause irritation as this can worsen their condition.

A more minor but still important consideration is that these fibres are worn all day and often for several days. In order to be useful they must be comfortable to wear and not cause irritation over long periods of time.

Keratin is an ideal material for hair building fibres. As it is the same material hair and skin are made from, they do not cause any allergic reaction, and are non-irritating even for long periods of time. Other materials such as cotton and rayon have been experimented with. Whilst these are cheaper they can cause allergies, irritation, and be much less comfortable when worn constantly for a number of consecutive days.

## Colourfastness

Any product worn on the hair will be exposed to UV, light rain and perspiration if worn on a daily basis. The majority of hair fibre users do not admit to using the product, and so it is essential that the fibres do not change in any way, or leave stains or marks.

Some fibres have been reported as reacting to UV, either by glowing under UV lights or even changing colour in bright sunlight. In other cases dye has been reported to run, particularly under light rain or when applied before heavy exercise.

A dye locking system that completely seals all the dye into the fibre itself is essential, and must resist even complete immersion in water to inspire confidence from users.

## Durable Results

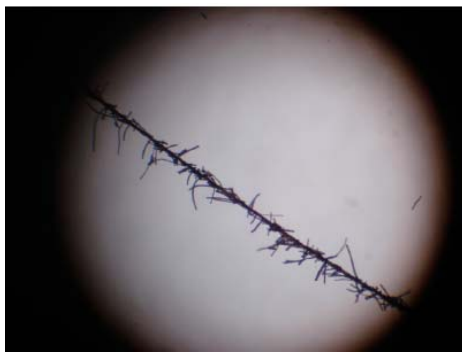
Similar to the previous problem in many ways is the problem with retaining the fibres all day, or for several days. Clients will not accept a product that rapidly falls out, or where the initial thickening effect does not last all day.

The key element here is electrostatic charge. Hair building fibres bind to the client's hair by having a strong electrostatic charge. There are a variety of methods to control the charge of a hair building fibre but most involve coating the fibre in certain materials or modifying the dispenser to increase the charge donated by shaking the fibres onto hair.

## Optimising Thickening

Hair building fibres work by attaching to the client's hair. They can lie parallel to the hair, and this creates a modest thickening effect. Alternatively they can branch off from the hair in what is commonly described as a "fir-tree pattern". This pattern creates a much larger increase in hair density, as every hair becomes coated in what are effectively perpendicular smaller hairs.

Every manufacturer of hair fibres will say that their fibres bind perpendicularly as this increases the thickening effect. This is partly true, a small proportion of any fibres shaken onto hair will land perpendicular to the hair shaft by random chance, however most will bind parallel to the hair as the electrostatic charge attracts them to the hair shaft.



**Figures 1 & 2.** Independent test report: A microscope slide shows the increased thickening effect given by significant perpendicular binding of fibres to a human hair. Figure 1, top, is a leading brand, Figure 2, bottom, are Nanofibres.

It is possible to increase the percentage of fibre binding beyond that given by random chance. If the fibre is engineered to be slightly conductive, the hair will induce a different charge onto the fibre. So where the opposite charges attract at one end of the fibre there will be one charge, however at the other end of the fibre there will be less charge, or even an opposite charge. The fibre is then said to be dipolar, or dipolar charged. This will hold one end of the fibre away from the hair, guaranteeing perpendicular binding. Some fibres may still bind in a parallel fashion, but with dipolar fibres a significant proportion will be perpendicular.

## Environmental Conditions and Hair Condition

It has already been discussed that light rain and perspiration can cause some fibres to leak dyes, but there are other conditions that can adversely affect the result they give.

Humidity changes the surface of the hair and the charge upon it- this is why many people find their hair harder to manage in high humidity. Because hair building fibres adhere to hair by electrostatic charge, changes in the charge of the hair can cause fibres to lose adhesion, or not adhere well when applied.

Hair condition also has a role. Hair treated with conditioners is coated with conditioning agents and emollients of the opposite charge to normal hair. This creates a similar problem to humidity; the conditioner makes the hair feel better and is desirable, but ruins the binding of many hair fibre products. One solution to this is not to use conditioners, or to use inadequate conditioners that leave the hair dry and uncoated. This does have advantages, drier hair shafts stand apart from each other, and the damage that is not repaired can make them look thicker. However this is not ideal as the feel and health of the hair itself is worsened simply for an improved cosmetic appearance, and is not desirable for clients.

A solution to the problem is to use a blend of highly penetrative humectants and amphoteric conditioners and surfactants. The correct blend will not coat the hair, and maintain the charge as amphoteric molecules will mimic whatever charge the hair naturally has.

Another possibility is to utilise the advantage of fibre conductivity. A fibre engineered to form a dipole can still bind even if the hair charge changes, it is more adaptable and will adhere in a whole variety of conditions.

## Water Resistance

The single largest drawback of using hair fibres compared to some hair replacement systems, sprays, and creams, is their lack of water resistance.

Most hair building fibres will, if correctly adhered, resist light rain and perspiration. However complete immersion in water will remove all of the fibres. There are several holding sprays available which improve the performance slightly, but not to the extent that most fibres remain in the hair.

The problem is that even when coated with a water-resistant polymer most of the fibres require a certain level of electrostatic charge to remain bound to hair. Previous water resistant polymers have allowed some small amounts of water into the hair and fibre, which changes the charge and causes the fibres to fall out.

An ideal solution would be a polymer that completely waterproofed the fibres and the hair so that the charges will not change when exposed to water. This will give the desired result - most fibres will stay in place. Of course in practice it is impossible to adequately coat every fibre with the polymer, and so some fibres will still be lost, but the aim is for the majority to remain in place.

## Nanofibres®

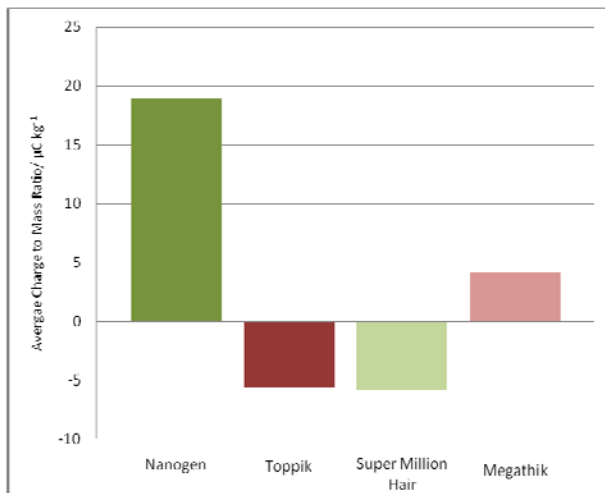
Nanofibres are the subject of over 10 years research and development.

Nanofibres have always been made of 100% natural keratin, and early development steps changed the original refining process of the raw keratin fibres. Today, Nanofibres are refined from only the best 10% of the raw keratin material to guarantee a close homology to human keratin, and the finest grade of fibre. This makes them uniquely consistent, comfortable, and non-irritating.

Later Nanogen focused on the unique Colour Lock System™. This system coats the Nanofibres after the dyeing process to lock the colour in place, and ensure the dyes do not glow or fade in UV. Nanofibres have been tested and the dye does not run, even when submerged in water for 24 hours. This gives Nanofibres users a unique level of confidence.

Part of the reason Nanofibres can only be made from the select 10% of the raw keratin is that the shape, size, consistency and structure of each fibre has to be perfect. Nanogen's manufacturing process selects fibres with a very particular set of physical requirements, and adds a proprietary blended coating on every single fibre.

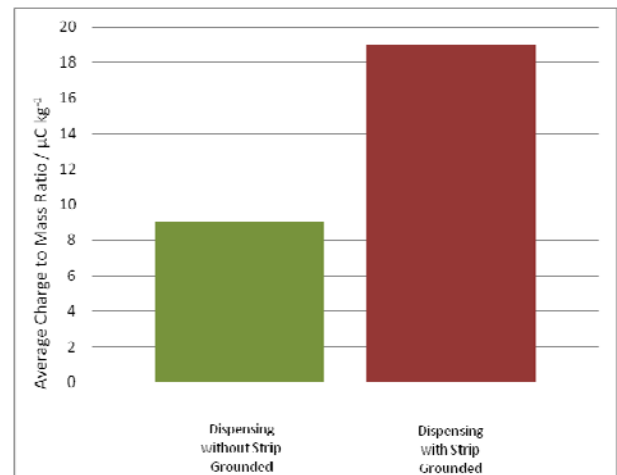
The specific shape, structure, and coating of every fibre allow Nanofibres to become dipolar charged. Significant dipolar charging has been proven to be unique to Nanofibres; it has also been proven by independent tests that significant perpendicular binding is unique to Nanofibres. Therefore Nanofibres are uniquely able to bind in a greater variety of conditions and give a better finished appearance. The processes for making the fibres and the content of the electrostatic coating are subject to 2 patents pending.



**Figure 3.** Independent test result: Graph shows Nanofibres have the highest average charge density compared to other hair building fibre brands after dispensing.

The Nanofibres active dispensing jar has also been extensively redeveloped. The addition of a more conductive electrostatic strip allows the container to be electrostatically neutralised before use, allowing the same build up of charge on the fibres for an entirely consistent effect with every use. An illustration of this effect is in figure 4, where the same Nanofibres container was tested with and without the electrostatic strip. Further

modifications to the jar structure and material help regulate and modify the electrostatic charge donated to the fibres to give unparalleled charge amplitude. This increase in the charge donated by the jar will give stronger fibre binding. These results have also been verified by independent tests and the jar design is subject to design protection and a patent pending.



**Figure 4.** Independent test result: Graph shows the increased charge density donated by earthing Nanogen's electrostatic strip before use.

## Nanogen® Shampoos & Active Conditioners

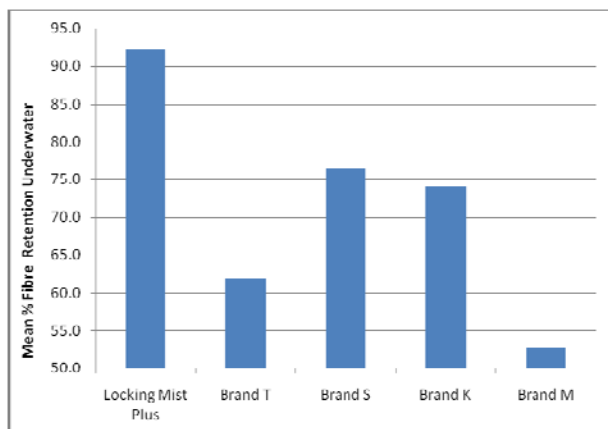
Whilst Nanofibres are able to bind to hair no matter what the hair is coated with, due to the dipolar charge, it is still beneficial to create the best possible environment for fibre binding.

Nanogen Shampoos and Conditioners are all formulated to be compatible with Nanofibres. Proprietary blends of penetrative humectants and amphoteric surfactants and amino acids create healthy looking and feeling hair. These perfectly mimic the hair's natural charge to ensure that even non-dipolar fibres would bind, and dipolar Nanofibres bind exceptionally well in all conditions. The combination of humectants and amphoteric molecules necessary to achieve this effect is patent pending.

## Locking Mist Plus®

New water-resistant polymers are developed all the time. What makes the blend of polymers used in Locking Mist Plus unique is that not only are they highly water resistant, they work to maintain the charge on the fibres so that they stay bound to the hair.

This gives breakthrough water resistance. The technology, called Hydroguard™, has only been finished this year and is also patent pending. Hydroguard™ maintains the binding of Nanofibres to hair in heavy rain, or even when completely immersed in water. Of course not every fibre is covered by the Locking Mist Plus, and so small amounts are lost, but the majority remain even while swimming.



**Figure 5.** Laboratory test result: Graph shows Locking Mist Plus significantly increases fibre retention under water.

## Conclusion

It is obvious that thinning hair is becoming a more widely recognised issue, and greater numbers of people are looking for a discreet and flexible solution. Hair building fibres are increasingly becoming the recommended choice of professional stylists, trichologists, and hair transplant surgeons.

Your clients want the strongest fibre binding, the greatest hair thickening effect, and reliable coverage in all conditions no matter what their hair has been treated with. The patent pending technologies in Nanofibres give an unrivalled performance in all areas, and make them the market leaders in this field.

## Acknowledgement

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