天然的演绎

蛋白生物聚合物

演绎

功能性护发

Innovation you can build on™

CRODA

Proteins - What Are They?
蛋白质-什么是蛋白质？

- Complex nitrogen-containing substances made up of amino acids　由氨基酸组成的含氮复合物
- Components of all living matter 是所有生物的组成成分
  - Amino acids are the building blocks of living systems 氨基酸是生命体系的基础材料。
  - Survival without them is impossible　生物不可能在缺乏氨基酸的情况下生存。
- They are natural products　它们是天然的产物
- Proteins may be processed to create personal care ingredients that provide impressive functional benefits from natural derivation　蛋白质可经过加工，以获取个人护理成分，这些成分可从自然衍生中提供可观的功能优势。
- 我们称它们为…

Nature's Performers

大自然的演绎者

蛋白生物聚合物

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Potential Protein Sources
蛋白质的来源

- *Wheat* 小麦
- Corn 玉米
- Soya 黄豆
- Almond 杏仁
- Oat 燕麦
- Egg 鸡蛋
- Milk 牛奶
- Silk 丝蛋白
- Elastin 弹性蛋白
- Potato 土豆
- Rice 大米
- Sesame 芝麻
- *Lupin* 羽扇豆
- *brazil nut* 巴西坚果
- *apricot* 杏
- *Pea* 豌豆
- Microalgae 微藻
- Keratin 角蛋白
- Collagen 胶原蛋白
- …

蛋白生物聚合物

Types of Proteins
蛋白质的种类

- Native Proteins 天然蛋白质
- Enzyme Hydrolysates 酶水解物
- Acid Hydrolysates 酸水解物
- Alkaline Hydrolysates 碱水解物
- Quaternised Proteins 季铵化蛋白质
- Acylated Proteins 酰化蛋白
- Protein Copolymers 蛋白质共聚物

蛋白生物聚合物

不可缺少的大自然演绎者。。。

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天然的演绎

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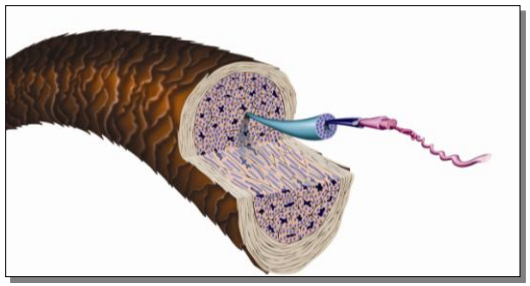
Agenda议程

- Understand Hair anatomy 了解发丝的结构
- Ethnic hair variance种族头发比较
- Signs of damage 各种头发损伤成因
- What can Biopolymers Help? 如何利用蛋白聚合物保护和修复损伤秀发？
  - Anti-Frizz 抗毛躁，使造型持久
  - Nutrition Repair 滋润修复
  - Environmental Protection 对抗环境胁迫
  - Anti-breakage 抗断裂

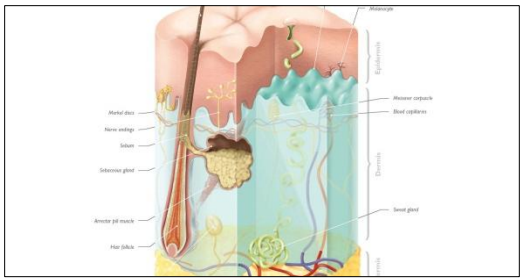
蛋白生物聚合物

Hair anatomy头发 与 头皮



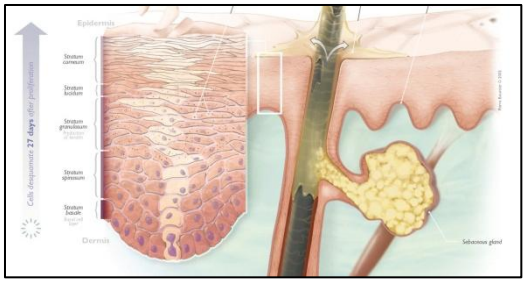
Hair length 发丝结构
- Cuticle表皮/毛鳞片
- Cuticle lipids表皮脂质
- Cortex皮质

Influence 因素
- Shine光泽
- Colour颜色
- Style / shape造型/形状
- Strength强度



Hair follicle毛囊
- Dermal papilla 毛囊毛乳头细胞
- Matrix基质体
- Inner / Outer root sheath内外根鞘
- Hair Shaft 发干

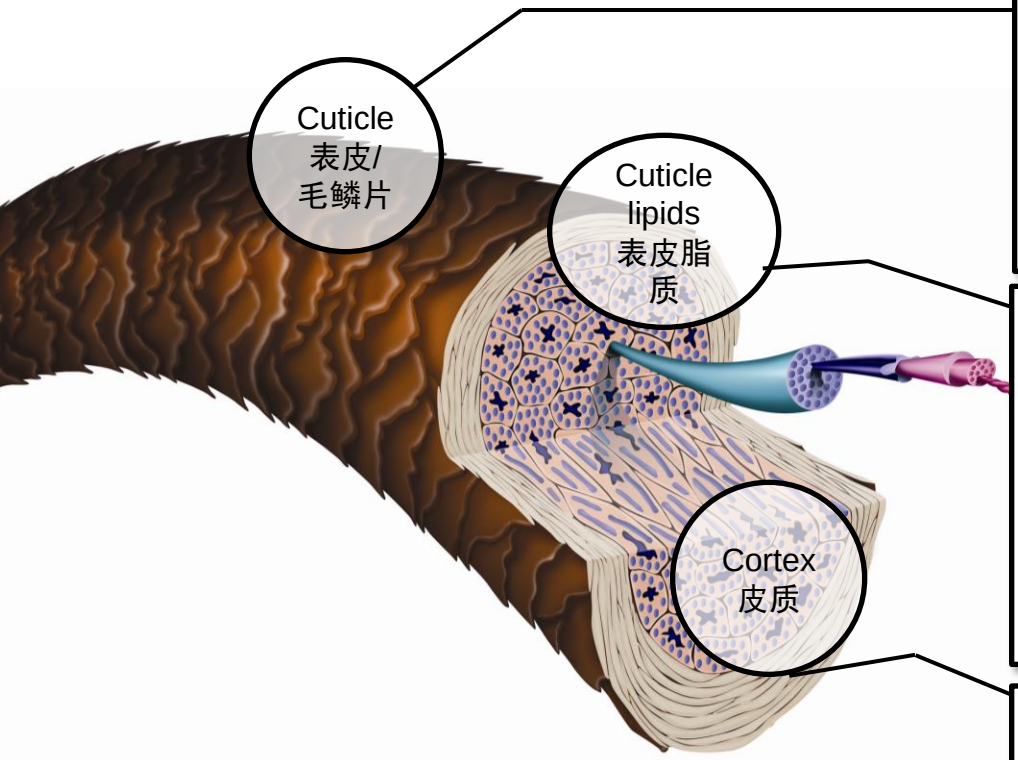
Influence因素
- Pigmentation染色
- Shape / size of length形状/长度大小
- Cuticle strength表皮强度
- Hair growth cycle头发生长周期



Surrounding dermis头皮
- Stratum Corneum角质层
- Keratinocytes角质细胞
- Follicle anchoring毛囊锚固
- Microflora微生物群落

Influence因素
- Scalp itch / flaking头皮痒/剥落
- Follicle nutrition毛囊营养
- Hair fall掉发
- Hair support头发支撑

Hair Structure发丝结构



- Acts as a protective barrier for the softer inner structure为柔软的内部结构，提供保护性的屏障
- Formed from keratinized cells 由角质细胞生成
- Regulates moisture content of hair fibre调节发丝纤维的水分含量
- Cuticle condition is primary factor in shine毛鳞片的质素最影响头发的光泽性

- Key lipids that coats hair fibre to keep hair hydrated and optimised覆盖头发纤维的主要脂质，使头发保持水分及最佳状态
- Infused with keratin and formed in the follicle sebaceous gland有角蛋白，形成于毛囊皮脂腺
- Comprised of fatty acids, ceramides, triglycerides, cholesterol包含脂肪酸，神经酰胺，甘油三酯，胆固醇

- The bulk of the hair fibre头发纤维的主体
- Comprised of long fibrous chains of hard keratin由硬质角蛋白的长纤维链组成
- Strength and elasticity is attributed to the cortex强度和弹性归因于皮质
- Melanin is found here in the cortex and gives hair its colour黑色素存在于皮质中，赋予头发颜色

Ethnic hair variance种族头发比较

Hair type头发类型	Caucasian 白种人	African 非洲人	Asian 亚洲人	Hispanic 拉丁美洲人
Oiliness油腻度	Dry to oily 干性至油性	Dry 偏干性	Oily 偏油性	Dry to oily 干性至油性
Cuticle size distribution (μm) 角质层尺寸分布(μm)	29 – 96 (平均70)	46 – 120 (平均90)	36 – 125 (平均92)	30 – 120 (平均70 – 92)
Shape of hair 头发形状	Oval 椭圆形	Flat 扁平的	Round 圆形	Oval / flat / round 椭圆形/扁平/圆形
Natural style 天生形状	Straight to wavy / curly 直发至波浪型/卷曲	Wavy to very curly 波浪型发至非常卷曲	Straight to wavy 直发至波浪型	Straight to wavy / very curly 直发至波浪型/非常卷曲

The Amino Acid Content of Hair & Cuticle
头发 和 毛鳞片上的氨基酸含量

氨基酸 Amino acid	含量 Content in residues %	
	整条头发	毛鳞片
磺基丙氨酸	0.34	0.88
天门冬氨酸	5.77	3.09
苏氨酸	7.45	4.41
丝氨酸	11.52	16.89
谷氨酸	12.95	9.25
脯氨酸	6.80	6.46
甘氨酸	6.11	9.74
丙氨酸	4.62	5.66
Valin	4.98	6.87

氨基酸	含量 Content in residues %	
	整条头发	毛鳞片
半胱氨酸	16.73	20.02
蛋氨酸	0.21	0.48
异亮氨酸	2.54	20.03
亮氨酸	6.49	4.62
酪氨酸	2.14	1.70
苯丙氨酸	1.65	1.21
赖氨酸	2.49	3.31
组氨酸	0.71	0.45
精氨酸	6.51	2.74

The Amino Acid Content of Hair & Cuticle
头发 和 毛鳞片上的氨基酸含量

- 胱氨酸在毛鳞片上的含量很高，是保护屏障的重要成分
- 头发中，所含的酸性氨基酸比碱性的多，因而形成了头发本身的阴离子性
- 皮质部分的蛋白排列是基于酸键的，它所含的的酸性蛋白比毛鳞片的多
- 半氨酸的含量在毛鳞片高，（它是头发受损后的一个副产品），代表头发受外界的影响比较多
- 头发受损后的区域，亲阳离子性会提高

Signs of damage头发损伤的迹象

Signs of damage 损伤的迹象

- Dulling晦暗
- Thinning变稀
- Breakage断裂
- Rigidity 变硬
- Frizzing毛糙
- Dryness干燥
- Porosity疏松
- Fading褪色的
- Scalp irritation头皮不适

External factors damaging hair 外部因素

- Combing / brushing 日常梳理
- Hair play 造型
- Heat 强热
- Pollution 污染
- UV degradation 紫外线辐射
- Stress 压力

Internal factors influencing damage 内部因素

- Hormone production 激素的生成
- Biological pathways 生理因素
- Diet / nutrients 饮食/营养
- Micro-circulation 微循环
- Collagen / hyaluronic acid / elastin decrease 胶原蛋白/透明质酸/弹性蛋白下降
- Sub-cutaneous fatty layer 皮下脂肪层

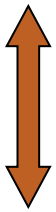
How Biopolymers care help?
如何利用蛋白聚合物处理损失的秀发？

- Molecular weight is important for functionality: 蛋白的分子量是功能的关键

Low M_w
低分子量

Moisturize, Penetration
保湿，渗透

Amino Acids氨基酸
Enzyme Hydrolysates
酶水解物



High M_w
高分子量

Film Formation
成膜

Derivatives 衍生物
High Mol. Wt. Proteins

- Low irritancy – across the molecular weight range 温和，低刺激性
- Liquid. Water soluble 水溶液

Functional Claims made for Proteins in Hair Care
蛋白生物聚合物 演绎 功能性护发

- Improve appearance and texture 改善外观和发质

- Improve wet combability 改善湿梳性
- Can reduce damage during chemical treatments 修复化学损伤 （例如：日常洗发）
- Help prevent and repair split ends 有助预防和修复头发分叉

- Increase moisture retention 提高发丝的湿润度
- Assist the penetration of dyes 帮助染发剂深入发芯
- Increase the uptake of anionic dyes增强阴离子染发剂的吸收
- Offer the potential for Permanent Conditioning 提供长效的调理性

Anti-Frizz
抗毛躁

Frizzing 毛糙

End-Look - products claiming to help achieve a desired end-look or style to the hair including products claiming to help to achieve shiny hair

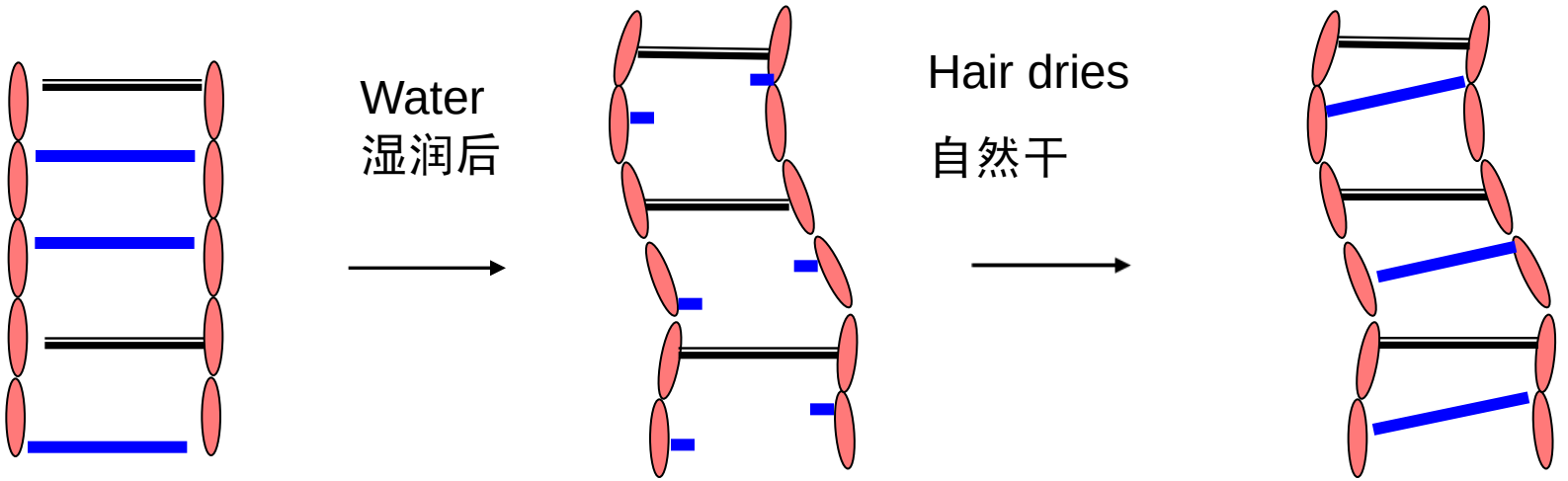
最终造型-产品宣称能帮助头发实现想要的最终样子或造型，包括宣称能帮助实现亮泽秀发

Products claiming to help smoothen, straighten, fight frizz, hair that has balance between body and frizz & tame your hair

产品宣称能帮助理顺、拉直、对抗毛糙，头发在强度和毛糙之间取得平衡，驯服你的头发

Anti-Frizz
抗毛躁

The Effect of Moisture水分的作用



Styled Hair造型的头发

Water breaks hydrogen bonds, disulfide and salt bridges ‘pull’ hair back into natural configuration
在湿润过程中，水破坏氢键，二硫化物和盐桥把头发“拉”回本来的形状

Upon drying, hydrogen bonds reform in hairs natural configuration
当头发自然干时，氢键重新排列，头发的形状也被重组

Hydrogen Bonds氢键

Permanent Bonds永久键

Anti-Frizz
抗毛躁

Fight the Frizz对抗毛躁

The Aussie Frizz Miracle range

- Designed to tame and smooth frizzy hair.驯服并顺滑毛糙的头发
- Shampoo with Australian blue gum leaves extract to smooth and control unmanageable hair含澳大利亚蓝桉叶提取物的洗发水顺滑头发并控制难以打理的头发

Tigi Bed Head Straighten Out Crème Lissante柔顺乳

- Designed to provide 98% humidity protection and 48-hour straight hair with improved manageability提供98%的湿度保护及48小时保持顺直，头发的管理性也提高
- Formulated with thermosetting polymers and conditioning agents to smooth the hair cuticle for super shine and calmed static, combat frizz, and add strength and elasticity配方含有热固性聚合物和护理剂，顺滑头发毛鳞片，呈现超级光泽和静谧，抚平毛糙，并增加强度和弹性

Anti-Frizz
抗毛躁

对抗毛躁 – 评估

Test products 测试产品

- Control: Ethanol 30% water 70% spritz
  对照配方：乙醇30%，水70%
- Mirustyle MFP™ PE 2.5% active from an ethanol 30% water 70% spritz
- Protocol : Apply spritz 3 times to wet hair at top, middle and bottom on both sides then comb through twice on both sides. Then leave to dry. Hair tresses used are black Spanish hair
- 方法：分别在湿发束的正面和背面；顶、中和底部各喷洒一次，合共六次。然后在两面各梳通两次，放在通风阴凉的地方自然干。使用的是黑色西班牙人种的头发

含MiruStyle™ MFP PE 的基础造型喷雾

不含MiruStyle MFP™ PE 的基础造型喷雾

MiruStyle™ MFP PE: 水（和）羟丙基三甲基氯化铵水解玉米淀粉

Maintaining the Style保持造型

Functional Care 功能性护理

Care - products dealing with repair, care, restoration and protection of hair that has been damaged by external forces

护理—产品涉及修复、护理、还原及保护被外力损伤的头发

Nutrition Repair 滋润修复
For dry & damaged hair due to natural dryness or damage对于由于自然干燥或损伤造成的干性受损头发

Environmental Protection 对抗环境侵害
To protect the hair from specific seasonal aggressions and daily environmental aggressions (pollution, UV, weather)为了保护头发免受特定季节侵害及日常环境侵害（污染、紫外线、天气）

Anti-Breakage 抗断裂
Products that when formulated into appropriate applications provide the end consumer with strength, healthy hair especially for aging hair
产品配制入适当的应用配方中时能为终端消费者提供强韧、光泽、健康的秀发，尤其是对老化的头发

Cropeptide W

保湿专家

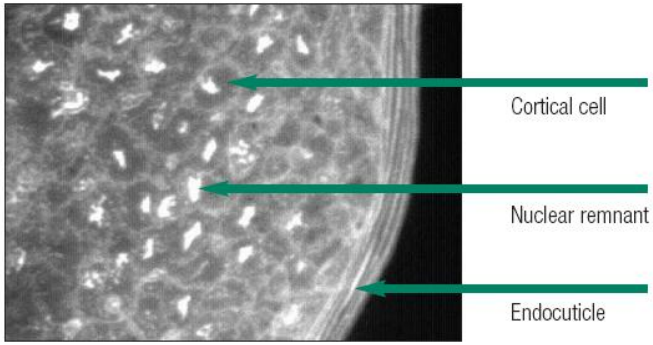
滋润
修复

独特优点：
- 能在头发表面成膜 Forming a film on hair surface
- 同时也能渗入发丝中 can also penetrate into hair fiber
- 双重保湿功能
- 双重保障

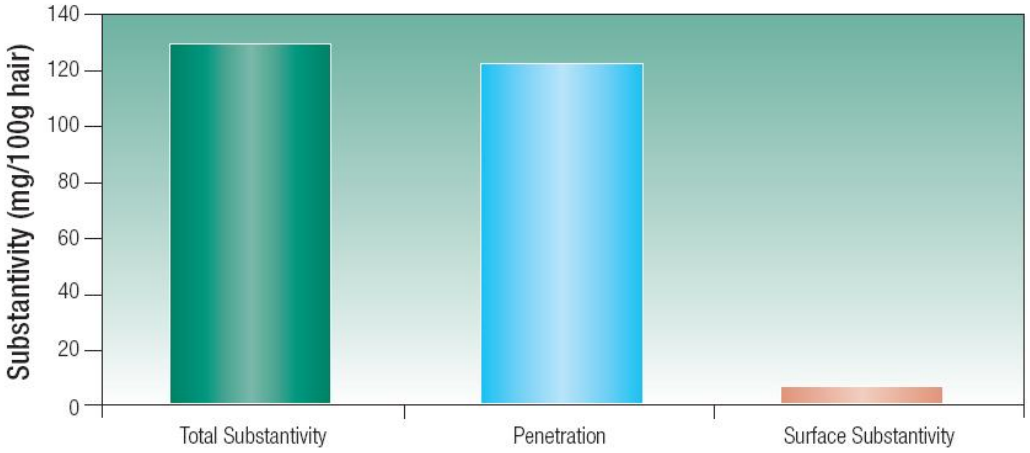
INCI：Aqua (and) Hydrolyzed Wheat Protein (and) Hydrolyzed Wheat Starch
INCI：水解小麦蛋白/水解小麦淀粉 Hydrolyzed Wheat Protein (and) Hydrolyzed Wheat Starch
类型：酶水解

Cropeptide W – 渗入发芯研究

荧光显影显示Cropeptide W对头发的亲和性非常高，并且能深入头发的发芯



以^{14}C 标志方法，评估Cropeptide W的渗透能力



Cropeptide W

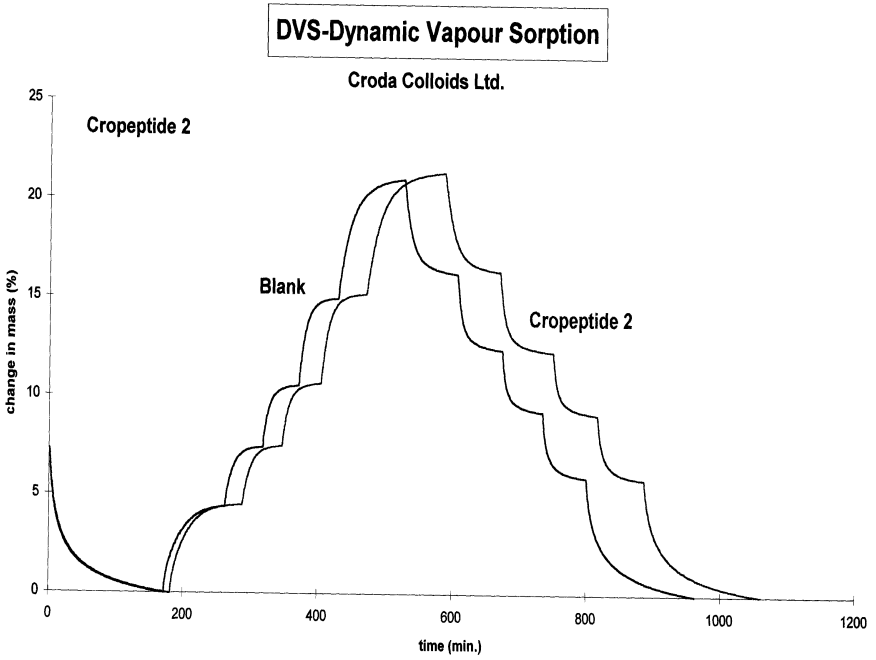
保湿专家

滋润
修复

Cropeptide W – 头发水分调控研究

方法： 使用动态蒸气吸附仪器，在不同的相对湿度下，测量未处理发束和用1%Cropeptide W活性物处理过的发束的水分等温线和水分含量达到平衡的速度。

- Sorption / desorption of water
- A difference in kinetic (rate) is observed.
- Cropeptide W (leave on) slows down the uptake of water and releases the water more slowly as well.



结果：Cropeptide W限制过多和过快的水分流失和吸收；在相对湿度较低情况下延迟水分流失，防止头发干燥；在相对湿度较高情况下能保持头发的造型。

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CRODA

Crodasone W

大自然治疗的力量

滋润
修复

Crodasone W – 热保护研究

日常使用塑发工具如烫发器等，使头发干燥，毛鳞片翘起和弯曲，头发表面变得不平滑
图1：因高度热力而产生的纵向裂纹
图2：经2%Crodasone W护处理后，再被热风吹干，证明有效抵抗热损害

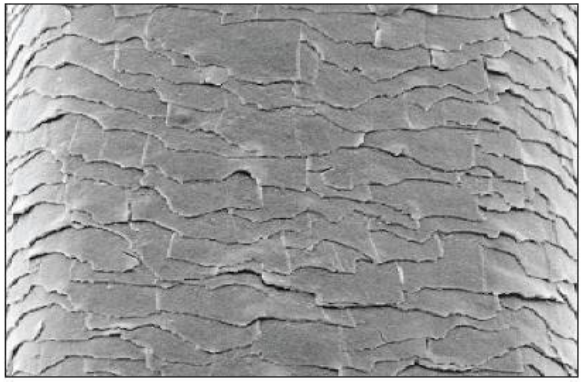


Figure 1: Vertical cracking caused by thermal stress

Crodasone W
•水解小麦蛋白和聚硅氧烷的共聚物
•对抗一般头发造型(如吹干，梳理和定型)引起的毛鳞片的损伤
INCI: Aqua (and) Hydrolyzed Wheat Protein PG-Propyl Silanetriol
INCI：水（和）水解小麦蛋白 PG-丙基硅烷三醇
类型：蛋白共聚物

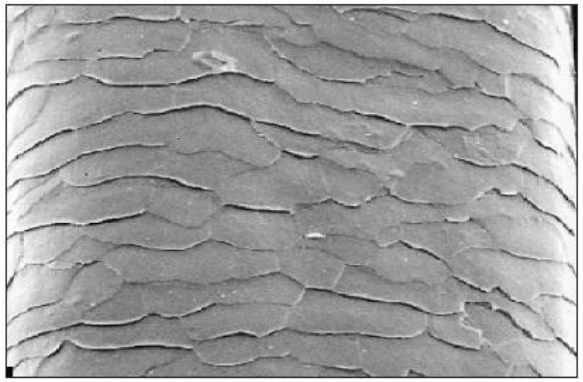


Figure 2: Crodasone W can prevent cuticle cracking

滋润
修复

仿生角蛋白

针对性的修复措施:
Keraminic 2.0

INCI:月桂基二甲基铵羟丙基水解角蛋白

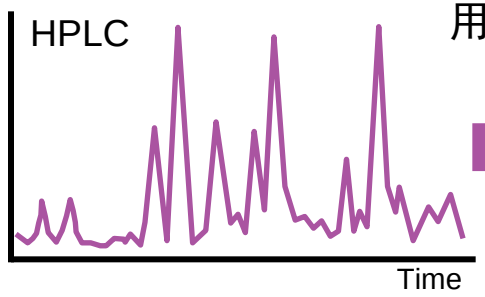
合并了两种崭新技术：
Proteomics 蛋白质组学
ToF-SIMS 飞行时间-二次离子质谱仪

蛋白质组学研究

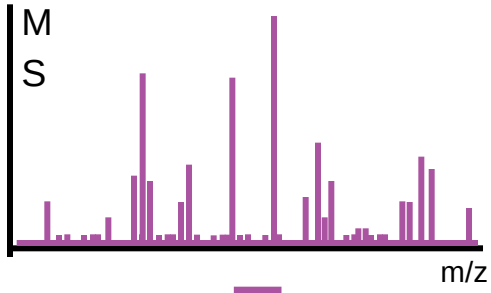
滋润
修复

Keramimic 2.0
多肽

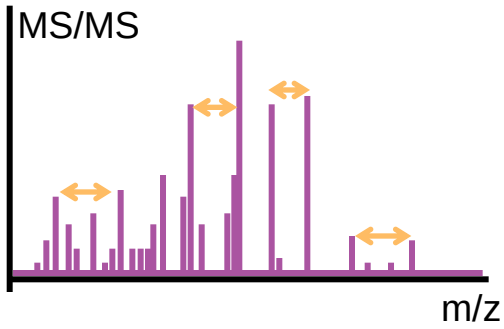
按质量分离



用质谱仪进行
分析



进一步使
用质谱仪



与蛋白质数据
库进行比对

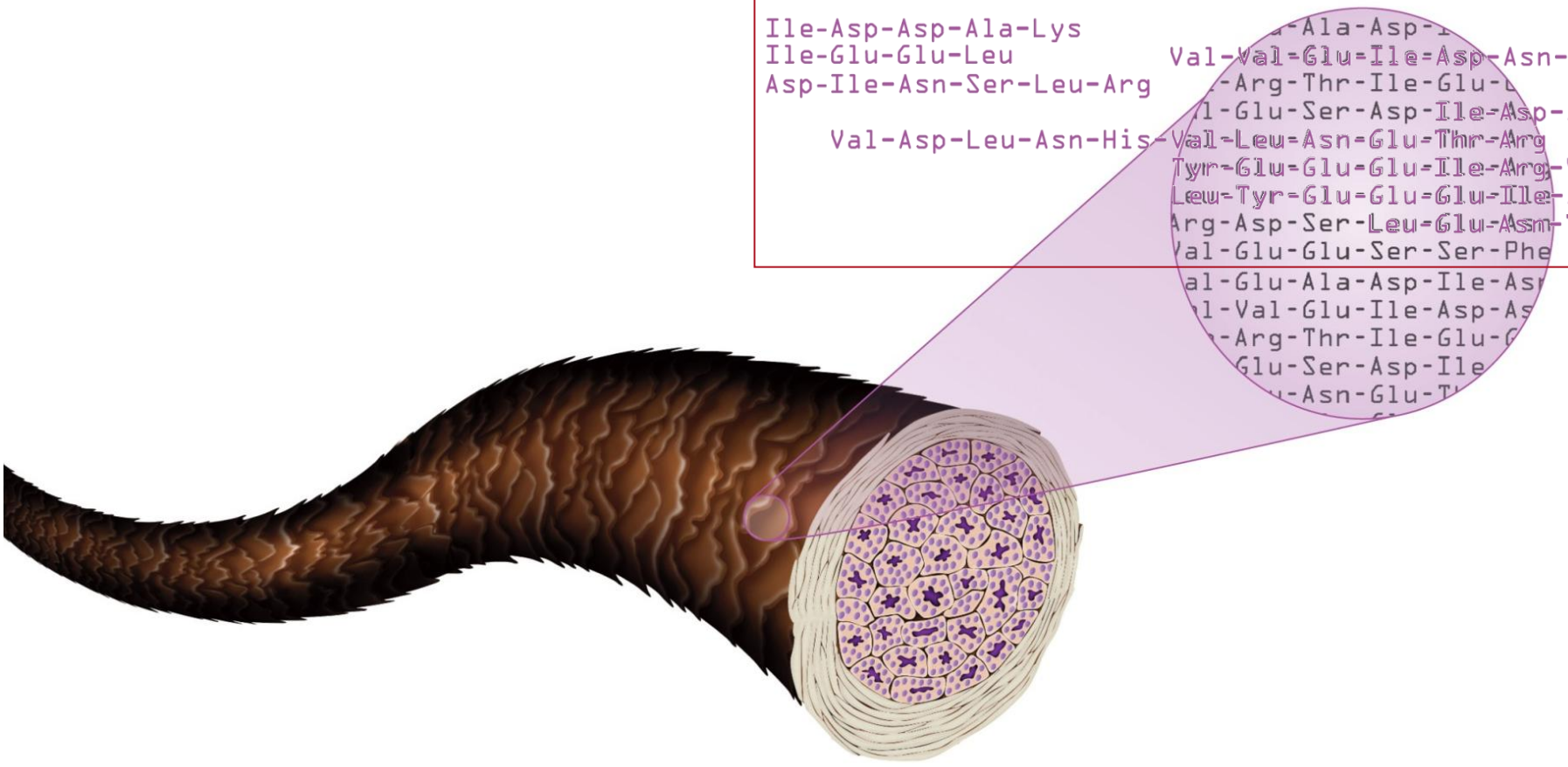
决定精确的
肽序列

Innovation you can build on™

CRODA

Keramimic™ 2.0 –Proteomics
Keramimic™ 2.0 –蛋白质组学

滋润
修复



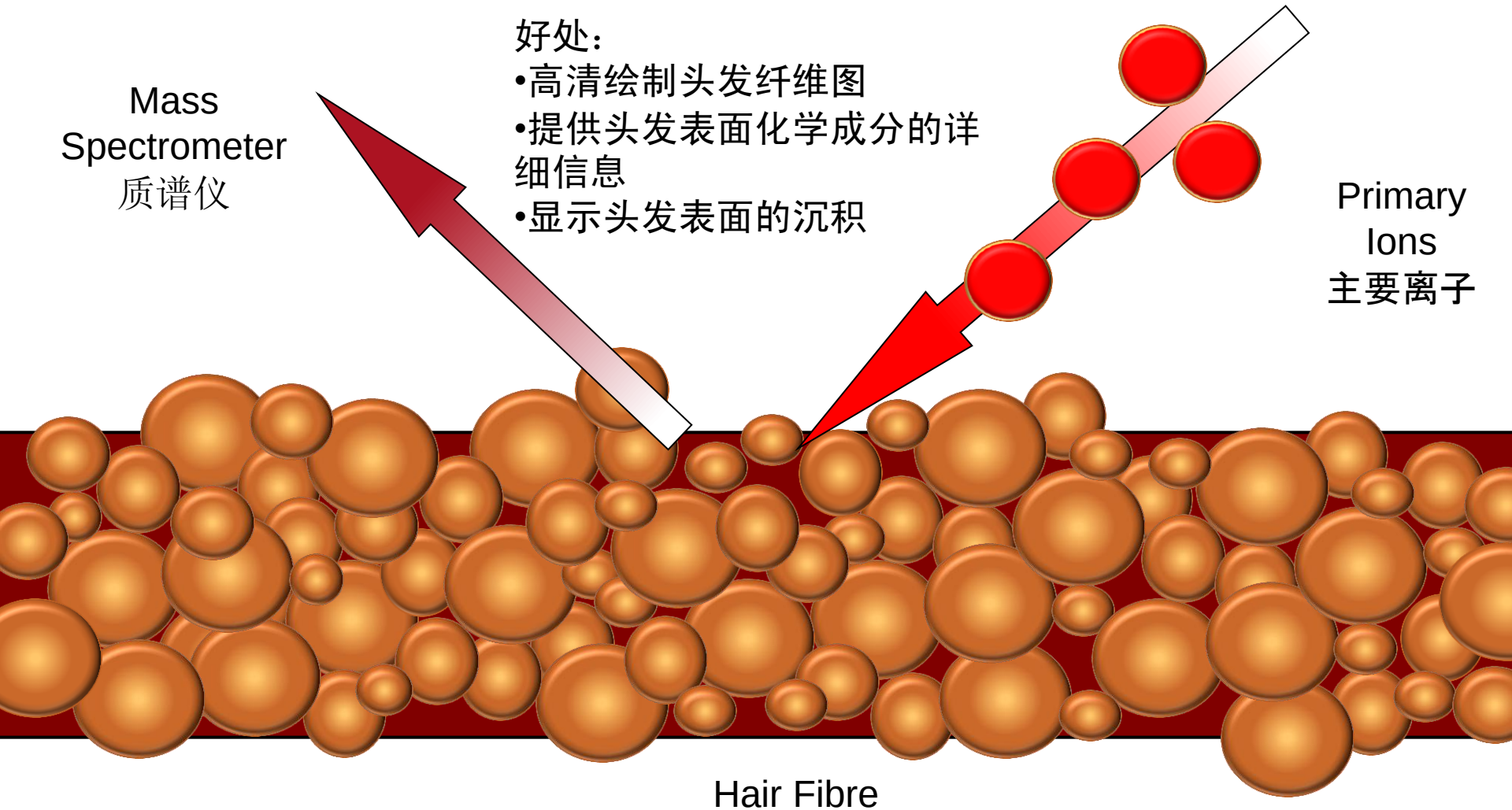
ToF-SIMS
飞行时间-二次离子质谱仪

滋润
修复

好处：
- 高清绘制头发纤维图
- 提供头发表面化学成分的详细信息
- 显示头发表面的沉积

Mass Spectrometer
质谱仪

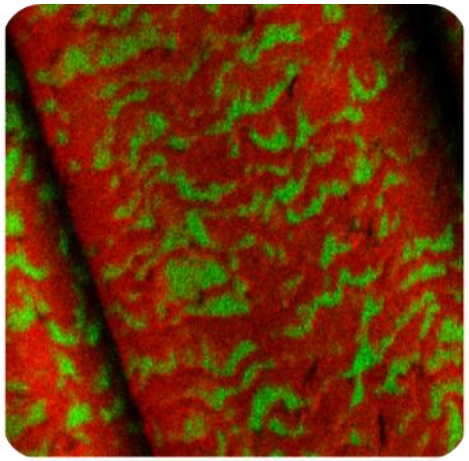
Primary Ions
主要离子



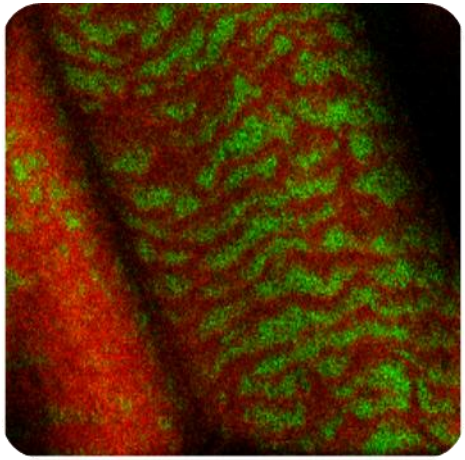
Hair Fibre
头发纤维

滋润
修复

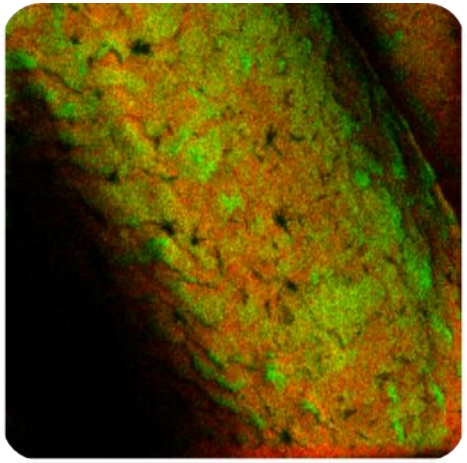
Targeted Repair针对性的修复



Root发根



Middle中部



Tip发梢

Keramimic™ 2.0 selectively targets the most damaged areas of the hairs surface
Keramimic™ 2.0选择性的针对头发表面受损最严重的区域
(荧光区显示Keramimic 2.0 附着于头发表面）

Environmental Protection对抗环境侵害

- Environmental stress include环境的侵害
  - UV radiation 强烈的UV照射
  - Ozone (O_3) 臭氧
  - Sulphur Dioxide (SO_2) 二氧化硫
  - Smoke 烟雾
- Environmental pollutants attack hair proteins and lipids leading to oxidation of cuticular amino acids and roughening of the surface 环境污染物攻击头发表面的蛋白质和脂质，导致的表皮的氨基酸降解，使毛鳞片变得粗糙
- Pollutant effects tested by two methods通过2种方法进行测试
  - Tryptophan degradation色氨酸的降解度
  - Combing Force梳理力

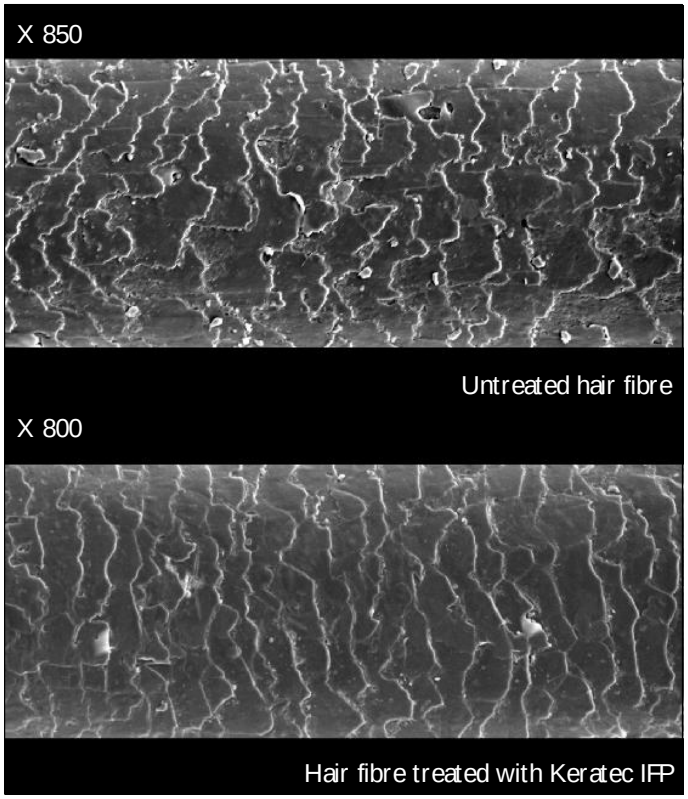
Environmental Protection
对抗环境侵害

Environmental Protection

Keratec™ IFP PE

- INCI：水（和）角蛋白（和）水解角蛋白
- Protection from environmental stress 防护环境带来的伤害
  - Forms a Keratec™ IFP PE protective shield 能形成强韧的保护膜

Concentrated Keratec™ IFP PE to 100% solids – forms an active flexible shield
100%固态的Keratec™ IFP PE 形成强韧的保护膜



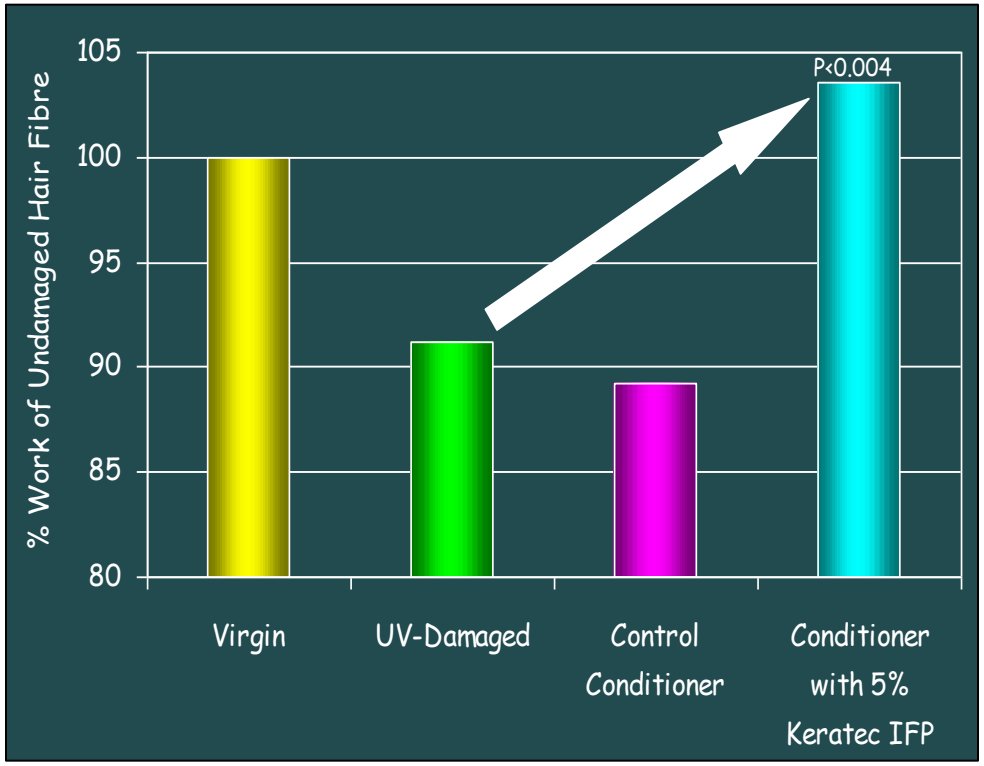
Film formation on hair fibre surfaces produces coherent cuticular films
在头发纤维表面形成保护膜，使毛鳞片平滑

CRODA

Environmental Protection

Artificial UV Irradiation 加速UV 照射

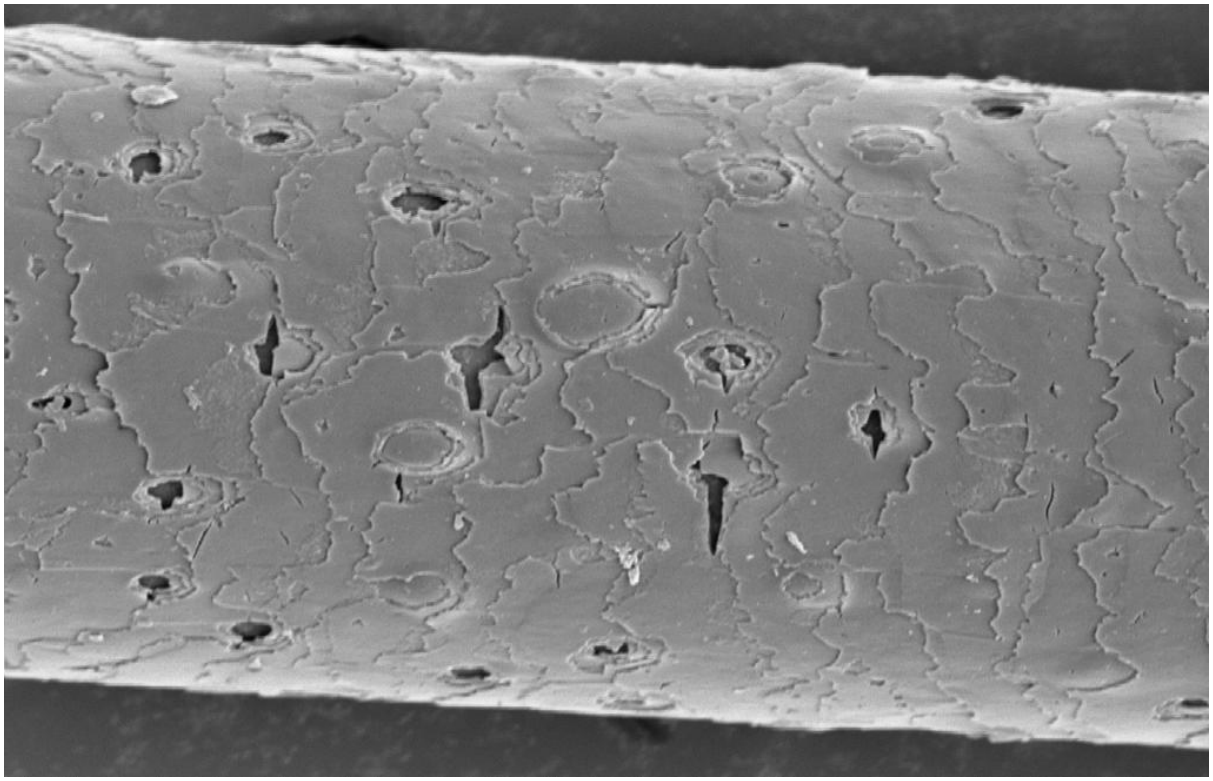
- Hair irradiated to provide an equivalent of 125 hours of natural sunlight 约等于125小时的日光照射
- Hair treated with conditioner containing Keratec IFP PE at 5% as-supplied (rinse-off protocol) 使用含5% Keratec IFP PE 的护发素然后冲洗
  - 第一次使用: Pre-irradiation 照射前
  - 第二次使用 : 照射25%的时间后



Virgin(基线): 无应用产品，无照射
UV-Damage：无应用产品，有UV照射
Control:对比，安慰剂，有UV照射

SEM of Pollutant Damage
臭氧使头发表面损伤

Environmental Protection

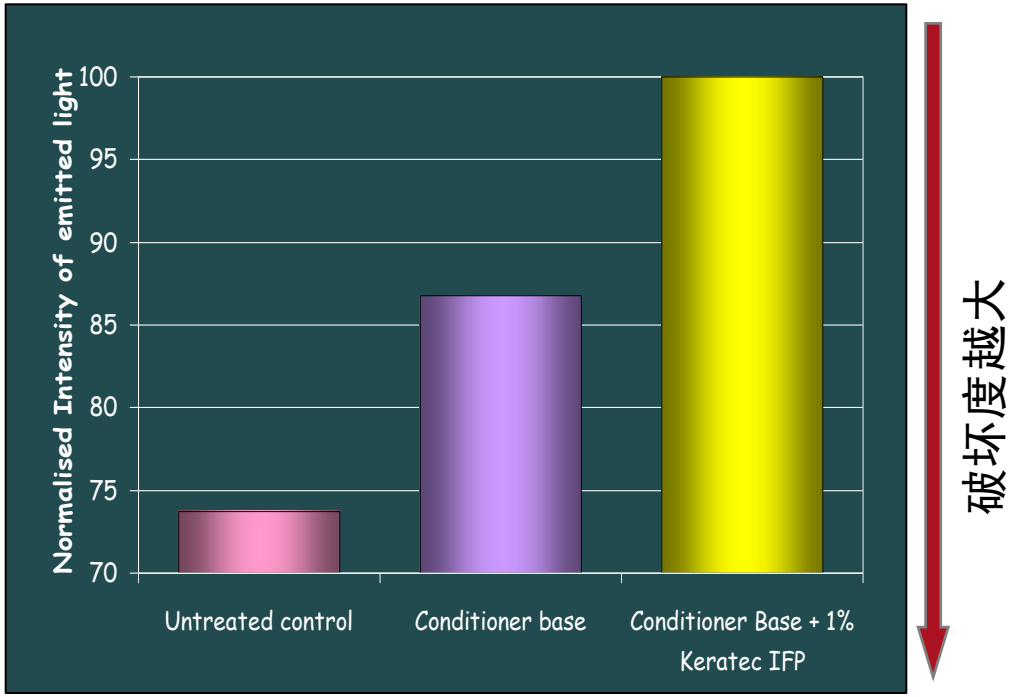


SEM of wet hair exposed to
0.1ppm ozone for 30s.

Ozone - Tryptophan Degradation
臭氧 -色氨酸降解度

Environmental Protection

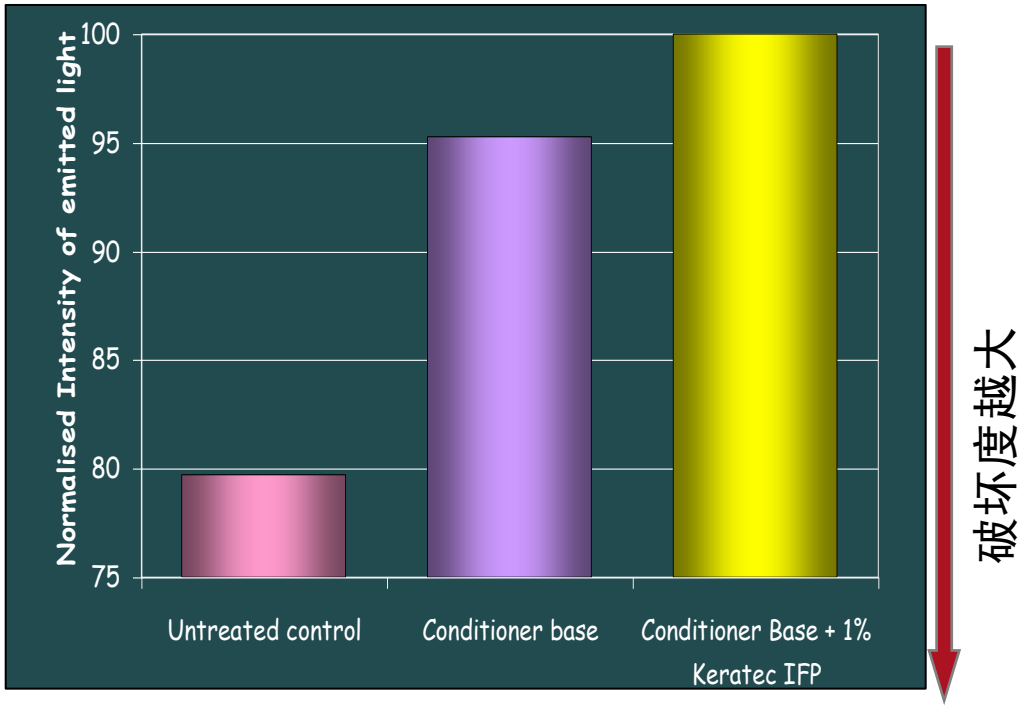
- Hair treated in following conditions
  - Untreated Control 对比
  - Conditioner Base (rinse off) 安慰剂（护发素）
  - Conditioner Base + 1% Keratec IFP (rinse off)
- Fibres exposed to ozone at 20ppm for 2min followed by surfactant wash 头发暴露在20ppm的臭氧中，2分钟，然后用表活洗净
- Spectra were recorded following the same protocol as for previous experiment UV 谱计算氨酸的降解情况



Sulphur Dioxide (SO_2) – Tryptophan Degradation
二氧化硫 – 色氨酸降解度

Environmental Protection

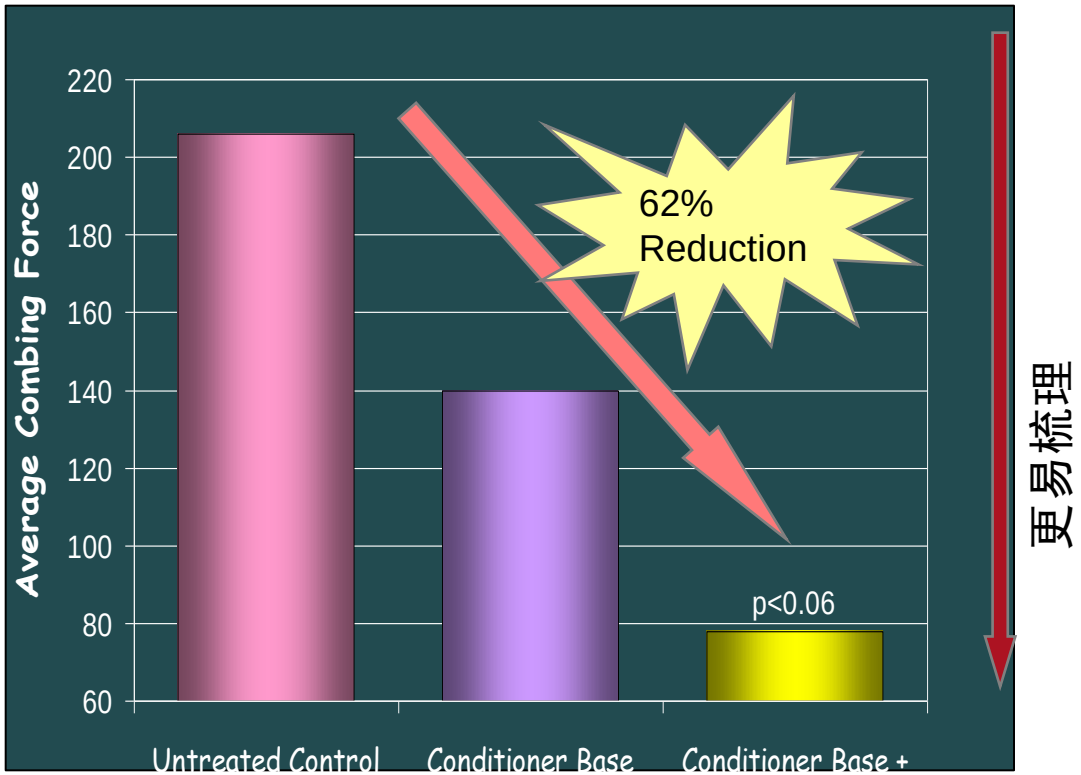
- Same test protocol used as in the ozone tryptophan experiment 与之前臭氧的测试方法相同
- Fibres subjected to five exposures of sulphur dioxide 头发束5次暴露在二氧化硫
- Each exposure consisted of placing hair in vessel containing SO_2 at 40ppm and left overnight, by which time level dropped to 0ppm 每次暴露于40ppm的二氧化硫的容器中，一晚的时间，直到容器中的二氧化硫水平为0ppm



Smoke – Combing Force
烟雾 – 梳理力

Environmental Protection

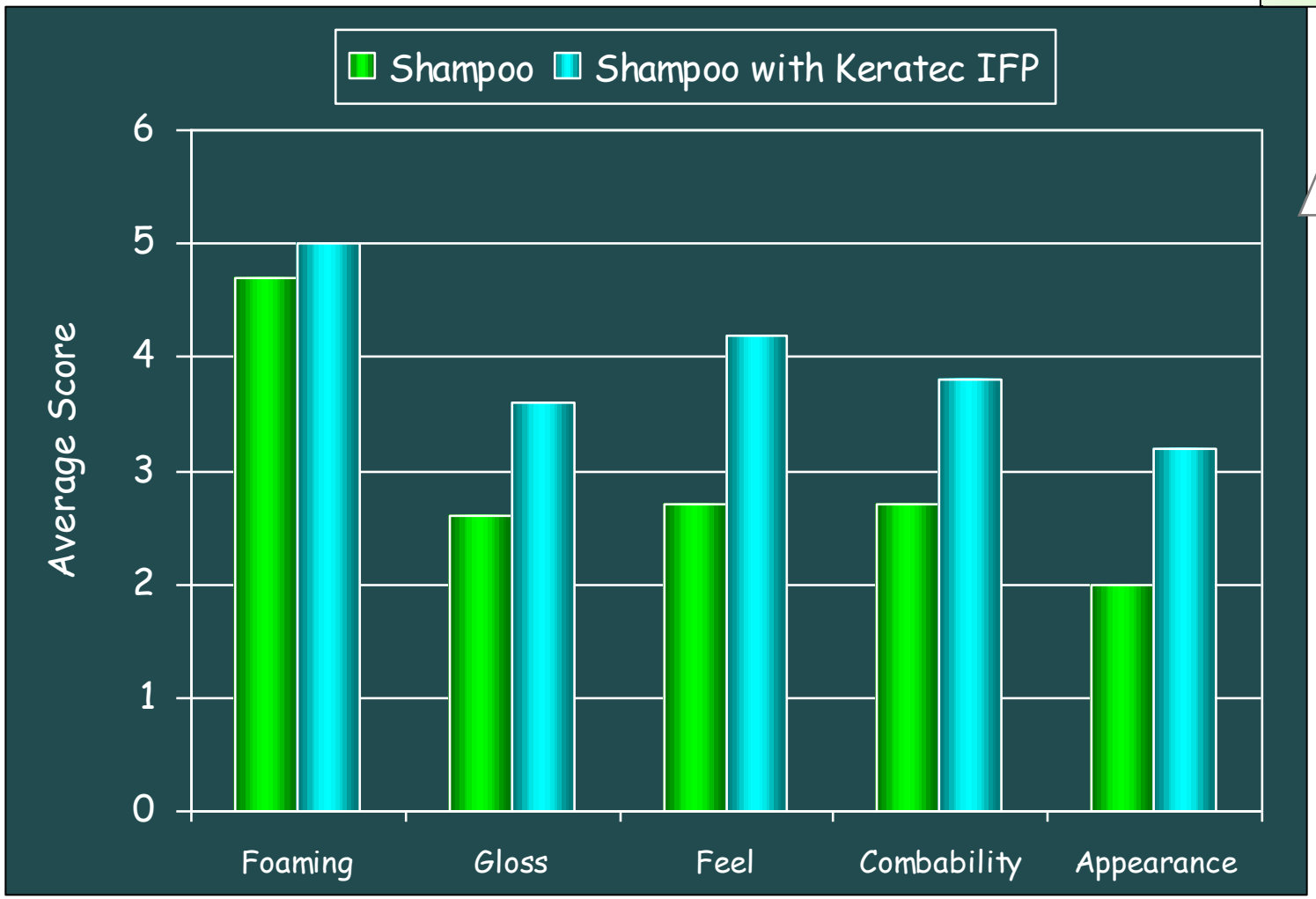
- Same test protocol used as in the ozone combing force experiment与之前臭氧的测试方法相同
- Hair exposed to cigarette smoke as cigarette was “smoked” for 10min and left to stand in smoke for 20min 在密封的容器中，头发暴露于烟雾中（燃点香烟10分钟，然后放置20分钟）
- Exposure was repeated 8 times with repeated treatment of conditioner/IFP after 4 cigarettes　8次暴露烟雾中，其中第4 和第8次后以安慰剂或含Keratec IFP护发素冲洗



Keratec IFP Enhances Consumer Perceived Performance

消费者的感官评价

Environmental Protection



更优的性能

Keravis – 抗折断

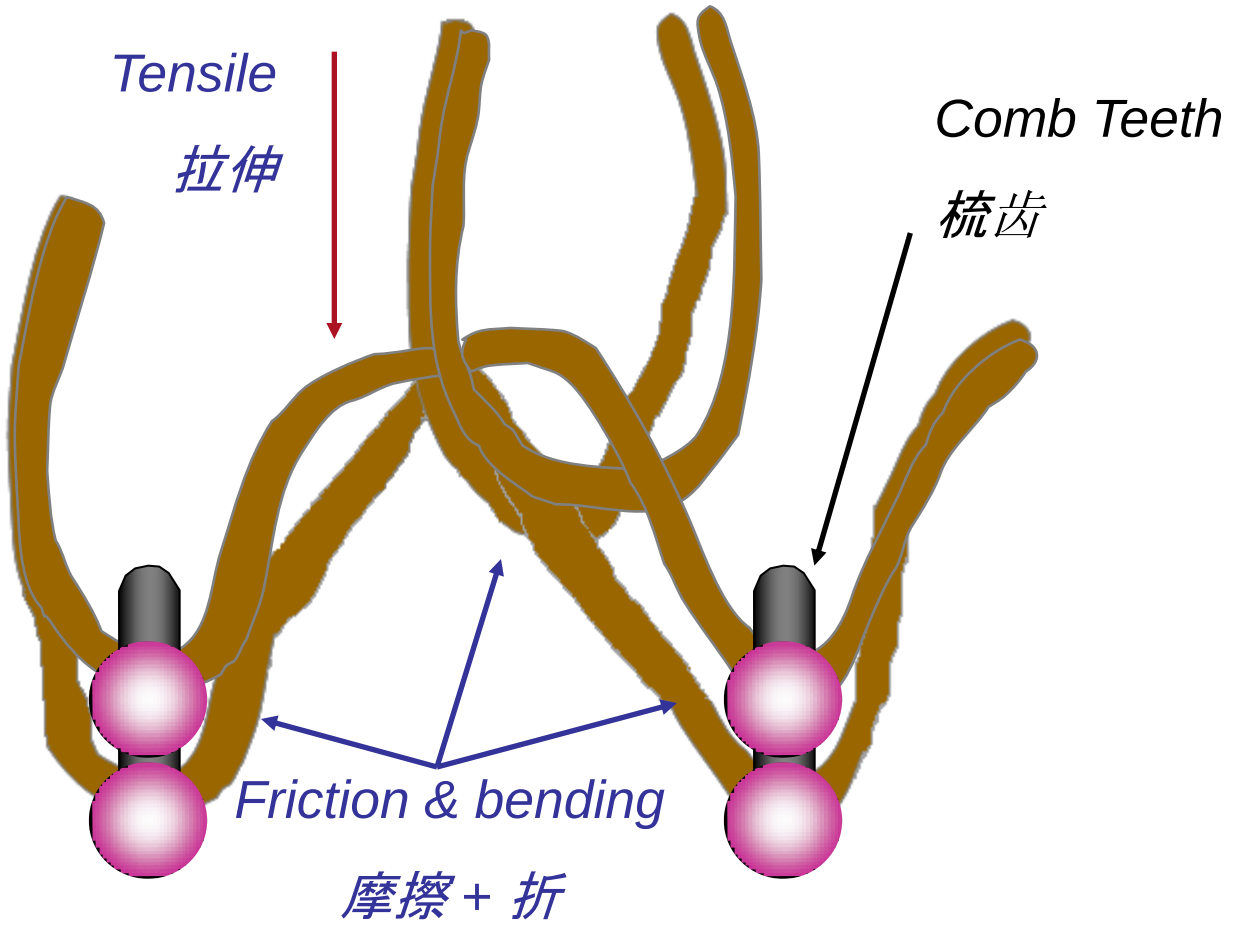
Anti-breakage
抗断裂

- Hair Strengthening Active 强韧头发
- Increases the strength of virgin and damaged hair 能改善任何头发
- Strengthens hair to resist combing damage 增强头发对抗日常梳理的物理胁迫
- Suitable for use in all hair care applications 适合所有发质
- Proven efficacy from rinse-off systems 在冲洗性产品证实有效
- Visible, consumer-perceivable improvement in hair strength 消费者认识，看见的改善

头发断裂的机理

Anti-breakage
抗断裂

Combing of a hair fibre tangle involves tensile, friction and bending forces



Flexabrasion Apparatus 挠曲磨损设备

Abrasion

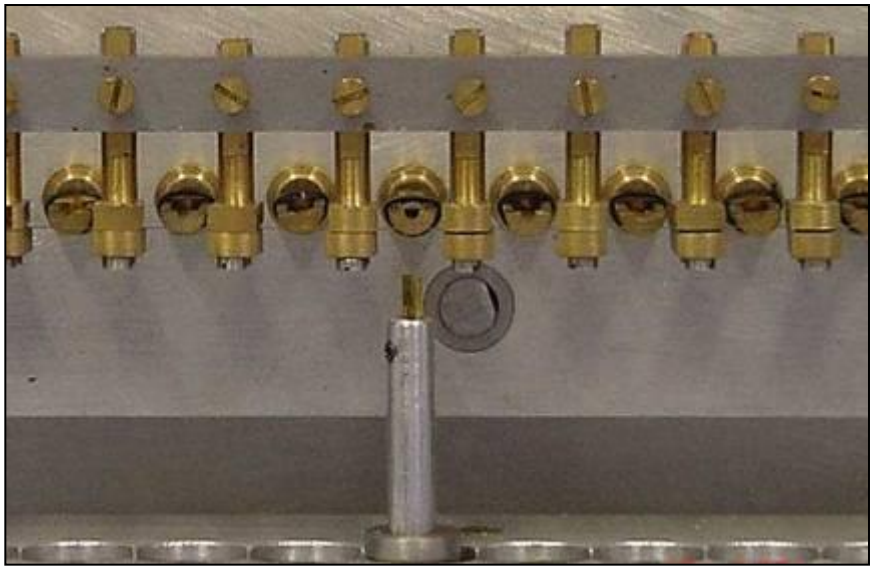
Reciprocating motion 往复运动

8mm Amplitude 8mm幅度

Variable Hz

Bending

200μm wire



Tensile force 拉伸力

Anti-breakage
抗断裂

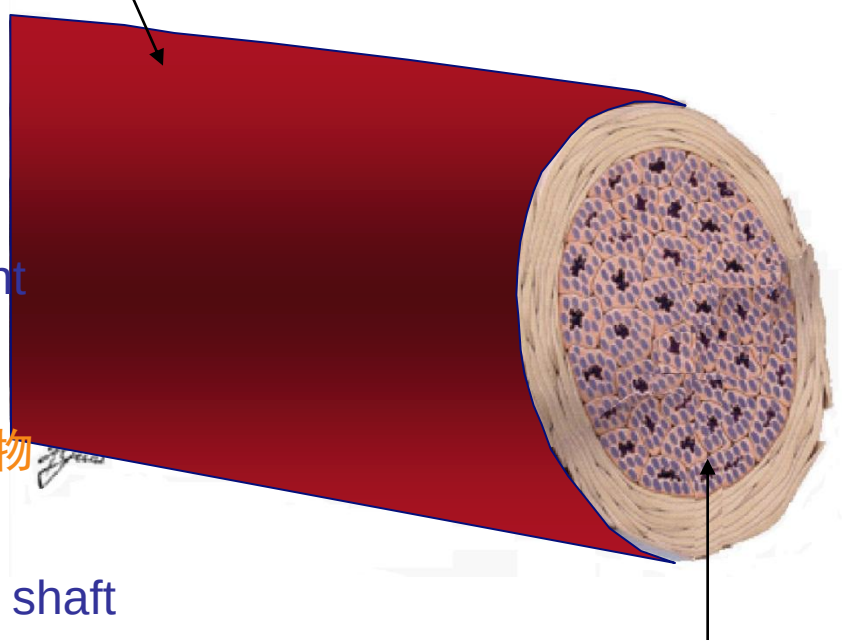
蛋白生物聚合物

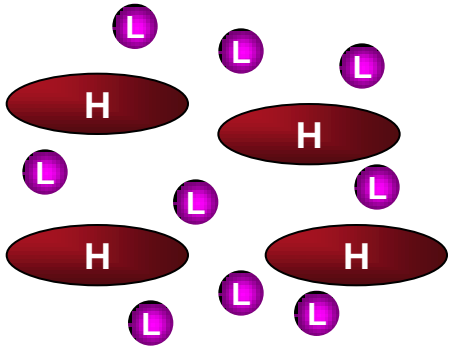
CRODA

Innovation you can build on™

Keravis 作用原理

Anti-breakage
抗断裂





Higher molecular weight components
copolymer siloxane-protein硅氧烷蛋白共聚物

↓

Form a film on the hair shaft

↓

Lubricate and reinforce the cuticle

Low molecular weight components

低分子蛋白

↓

Penetrate the Cortex

↓

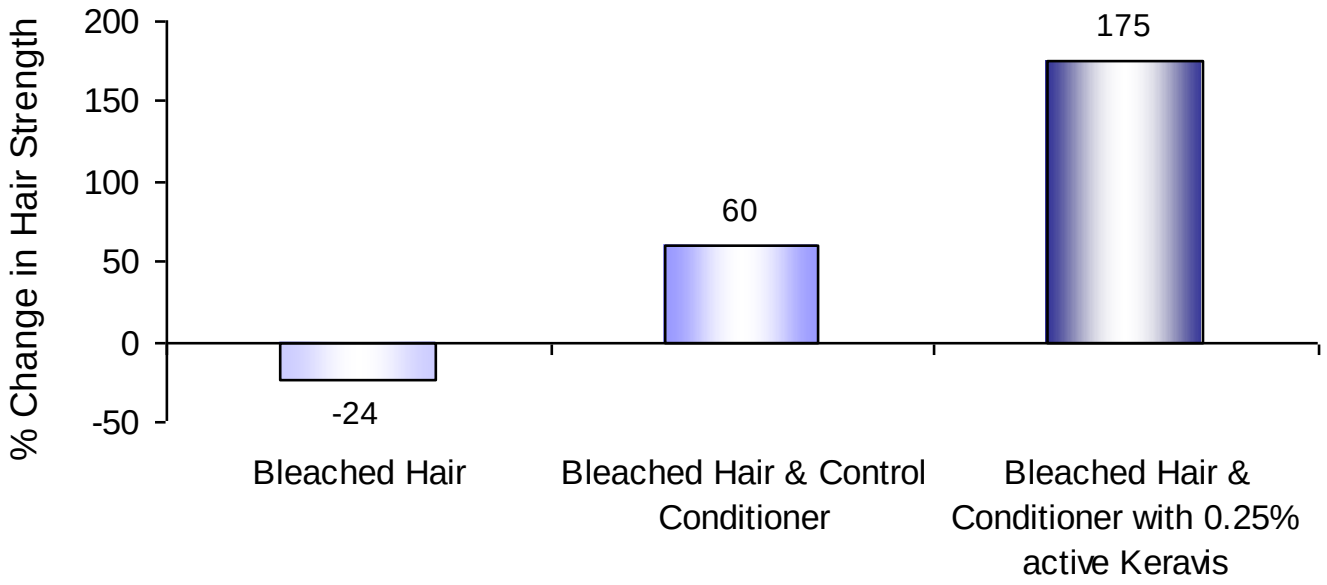
Moisturise and Plasticize the hair

Innovation you can build on™

CRODA

增强受损头发的强韧度

Effect of Keravis on Bleached Hair from a Rinse-off Conditioner



Keravis triples the strength of damaged hair!

蛋白生物聚合物

CRODA

Innovation you can build on™

Consumer Perceivable Benefit

Anti-breakage
抗断裂

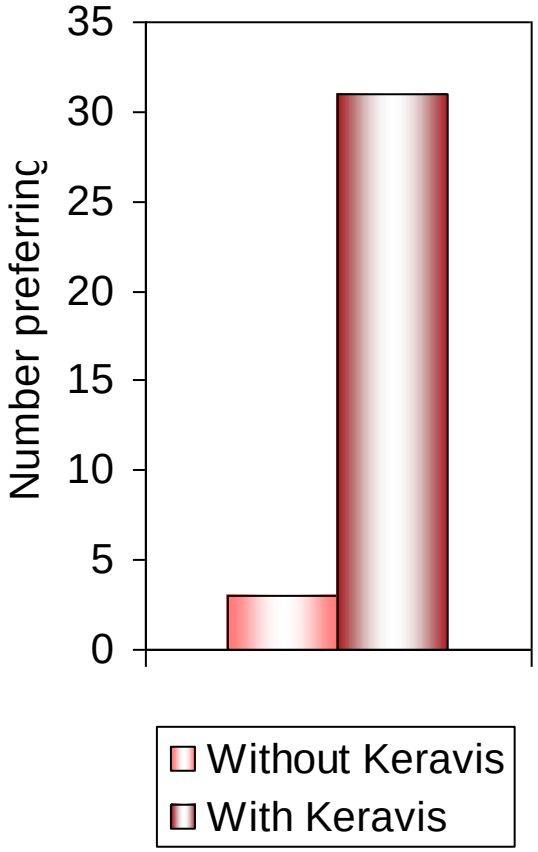
- Six virgin hair tresses washed twice with 10% SLES solution
- Three tresses washed with a basic shampoo
- Three tresses washed with the basic shampoo containing 0.25% active Keravis
- Tresses combed 10000 times on the combing wheel
- One tress with Keravis and one tress without Keravis were randomly selected and evaluated visually in a Forced Preference Test. Assessors were asked to choose which tress looked strongest and healthiest

未经Keravis处理 **经过Keravis处理**

Visible Strengthening

Anti-breakage
抗断裂

- 31 out of 34 respondents (91%) selected the tress treated with the Keravis shampoo as looking strongest and healthiest
- Evidence that Keravis gives a clear visually-perceivable improvement in the appearance of the hair after repeated combing



自然的演绎

谢谢！