

Abstracts

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Study on the Evaluation Method for the Combing Force of Human Hair*

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□The combing response is one of the important quality factors of hair care products. In this report, an objective evaluation method for combing response was discussed, and a new type of evaluation device that is equipped with a vertical articulated type robot and a comb type probe mounted to a strain gauge was developed. It is applied to a hair tress with the view to substitute combing action of a human hand. The objects of the study are the factor analyses of the conditioner components for the combing response and application to the development of hair care products such as hair conditioners, the effects of cationic surface-active agents, the constituent hair conditioner were discussed and the evaluation results were compared with a sensory evaluation. The experimental results are summarized as follows: the effects of the combing response to the hair conditioners, based on several levels of concentration and varieties of cationic surface-active agents, were accurately detected, and a correlation to the sensory evaluated values was observed. From these data, this evaluation method was estimated to provide a rapid and objective detection of the combing response and is applicable for the development of hair care products. From the measurement of normal and damaged hair, a precise, difference was detected and the method was found to be effective for the estimation of hair conditions.

□Key words: evaluation, combing force, hair, combing response, robot, strain gauge, hair tress, hair conditioner, cationic surface-active agents, sensory evaluation, damaged hair, stick-slip, friction

New Anti-Aging Cosmetic Ingredients - Lignan Glycosides in Germinated Sesame Seeds -

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□Demand for anti-aging cosmetics is increasing considerably. Until now, a great number of materials that are able to prevent human skin from aging (the anti-aging ingredients) have been sought by many researchers, however, few components were found to be useful in anti-aging cosmetics. Nowadays, the defensive functions in plants against oxidative stress from the outside have attracted considerable attention, therefore, we have aimed at applying new antioxidants in plants to the anti-aging cosmetic ingredients. Germinated sesame seeds were found to contain a strong natural antioxidant. As a result of purification and identification, it appeared that lignan glycosides were the main antioxidants in germinated sesame seeds, and we could succeed in discovering three new kinds of lignan glycosides. By evaluating the effectiveness of these compounds for anti-aging cosmetics, it was found that lignan glycosides showed scavenging activity on organic radicals, hydroxyl radical (ESR analysis), singlet oxygen, superoxide anion, and antioxidant activity against oxidation of squalene generated by UV irradiation and oxidation of linoleic acid induced by Fenton reaction. These results suggested that lignan glycosides in germinated sesame seeds were very useful as anti-aging cosmetic ingredients.

□Key words : anti-aging, natural antioxidant, antioxidant activity, germinated sesame seeds, lignan glycosides, squalene, linoleic acid, hydroxyl radical, singlet oxygen, SOD-like activity

* These abstracts appear exactly as they were originally published. They have not been edited by the *Journal of Cosmetic Science*.

Selective Adsorption of Fatty Acids for the
Prevention of
Foundation Makeup Deterioration*

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□Deterioration of applied makeup remains a serious concern for the busy modern woman, but little research has been published on this topic. Currently available “long-lasting” makeups do not perform satisfactorily, and a different approach is needed. Many forms of makeup film deterioration exist; our international survey of makeup users identified shiny spot formation following foundation application to be the problem most frequently complained of. Our goal was to identify those factors responsible for optical degradation and develop an effective means of countering this phenomenon. Our research confirmed that the secretion of sebum plays a key role in shiny spot formation. We studied the components of sebum causing optical degradation, and identified particular unsaturated free fatty acid (FA) as the main culprits. By lowering the melting point of sebum, unsaturated free FA caused wetting of the makeup substrate, altering its optical properties, leading to the formation of shiny spots. Understanding of the basic cause of optical degradation of the makeup film enabled us to design a new compound which can selectively adsorb specific FA. By chemically modifying the structure of certain clay minerals, we developed unique interlayered compounds having precisely controlled spacing of the silicate layers of the clay and selective adsorption properties. One compound we developed consists of zinc oxide precursor loaded in alumina pillar interlayered clay (ZA-pilc). *In vitro* and *in vivo* testing on powder foundations incorporating ZA-pilc proved that the compound was remarkably effective in suppressing optical degradation, prolonging the life time of makeup in actual usage conditions. Besides preventing optical degradation of makeup film, incorporation of ZA-pilc in cosmetic formulations may offer an additional benefit of reducing acne formation through selective adsorption of FA. Our experimental results indicate that ZA-pilc suppresses comedo formation in the ear of rabbits, suggesting the possibility of application in anti-acne preparations.

□Key words: questionnaire, deterioration, sebum, shininess, gloss meter, foundation, composition, fatty acid, makeup, montmorillonite, clay□

Effects of Long-Term UVA Exposure of Human
Skin Fibroblasts
on Cell Growth and Extracellular Matrix Formation*

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□Repeated exposures to sunlight cause sagging skin or deep wrinkles. These morphological changes, called photoaging, depend on the characteristics of dermal extracellular matrices (ECM), of which type I collagen is a major component. We studied cell growth and ECM formation of human skin fibroblasts under long-term UVA exposure. Secretion of type I procollagen was almost the same as that of the control, while cell growth and ECM formation were greatly inhibited. Reactive oxygen scavengers did not affect this inhibition. The effect of UVA was reproduced when the cells were cultured in UVA-irradiated medium, even though they were not exposed directly to UVA. The growth arrest was not seen when fresh fetal bovine serum was added to the UVA-irradiated medium. These results suggest that the inhibition of cell growth and ECM formation induced by long-term UVA exposure is due to denaturation of growth factors and/or chemokinetic factors rather than to direct cytotoxicity of reactive oxygen.

□Key words : photoaging, UVA, fibroblast, extracellular matrix (ECM), cell growth, collagen, C-terminal peptide, reactive oxygen scavenger, FBS, growth factor, chemokinetic factor

Liposomal Linoleic Acid Is Useful as a Skin
Lightening Agent*

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□Linoleic acid, one of the essential fatty acids, has a remarkable inhibitory effect on melanin synthesis by cultured melanoma cells. The activity of tyrosinase, an enzyme critical to melanin synthesis, was inhibited by linoleic acid but the level of tyrosinase mRNA was not affected, indicating that linoleic acid regulation of melanogenesis was due to post-transcriptional events. The inhibitory mechanism of linoleic acid was that it enhanced the proteolytic degradation of tyrosinase and led to a decrease in melanin production. In order to improve

the stability of linoleic acid, liposomes were employed, which occurred skin permeation and resulted in a substantial amount of linoleic acid in the skin. Clinical trials with liposomal linoleic acid for skin hyperpigmentary disorders, such as melasma, showed hypopigmenting effects, suggesting that liposomal linoleic acid is useful as a skin lightening agent.

□Key words : liposome, linoleic acid, skin, fatty acid, melanin, melanoma, tyrosinase, melanogenesis, proteolytic degradation, permeation, clinical trial, melasma

Evaluation of Foundations under the Influence of UVA Irradiation*

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□It was found that the foundation exposed to ultraviolet rays could accelerate the oxidization of squalene, a sebum component. This finding was based on the following experiment: 1) squalene and 2) squalene and foundation were applied individually on the human arm and exposed to sunlight for 1 h. Then, the levels of oxidization of 1) and 2) were compared by the TBA method. The result of this experiment led us to the above mentioned finding. Thus the oxidization level of the squalene exposed to ultraviolet rays was examined with regard to each powder component of the foundation in order to determine the causative factors involved. As a result, titanium oxide was identified as one of the factors. Hence, the powder component which has the titanium□oxide surface coated with silica was developed, thereby to make a prototype of foundation that will not allow□the oxidization of squalene to be accelerated. The effect of this new foundation on the skin was compared with□that of the conventional foundation using the back of a hairless mouse. The result verified that the newly developed foundation surpassed the conventional product in terms of mitigating the scale and induration in an epithelial change on hand, and inflammatory cell infiltration in a dermal change on the other hand. This suggests that□inhibiting the accelerated oxidization caused by the foundation exposed to ultraviolet rays can help mitigate their□adverse effect on the skin as well.□

□Key words : UVA-irradiation, foundations, squalene, oxidation, catalytic activity, inorganic powder, TBA□method, nude-mouse, cutaneous damages, titanium oxide

The Relationship between Moisture Content of Human Fingernails and the Mechanical Properties of the Fingernail*

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□It is well known that nail damages such as yellowing, split nails and peeled nails (onychosis) are caused by continuous use of nail enamel for a long period. Within serious nail damages, we aimed at split nails and peeled nails and basically investigated the relationship between fingernail moisture content and the mechanical properties of fingernails to make clear the factors affecting those nail damages. As a result, we newly developed the bending tester to evaluate split nail and peeled nail and established the method of evaluation of those nail□damages. Moreover it is suggested that fingernails split easily under low fingernail moisture content and peel easily under high fingernail moisture content.

□Key words : moisture content, fingernail, mechanical property, nail enamel, trouble, split nail, peeled nail, evaluation, bending test, SEM image

Novel Deodorizing Method with Glycosidically Bound Volatiles*

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□Glycosidically bound volatiles (GBVs) have been known as fragrance precursors in essential oil plants, but little attention has been paid to them as cosmetic ingredients. In this study, we investigated the possibility of GBVs as deodorant ingredients. After incubation of skin microflora with various kinds of GBVs, the amount of generated fragrance materials and remaining glycosides were analyzed with GC and HPLC. These results showed that most of GBVs could be metabolized gradually by skin microflora to

release various fragrance materials. Further, *in situ* examinations were carried out. After applying the solution of each GBV on various regions of the body, such as scalp, foot and forearm, the generated fragrance materials were analyzed by using headspace technology. And we confirmed that GBVs, particularly β -D-glucoside derivatives, also gradually changed to fragrance materials on the skin. In conclusion, odorless GBVs possess an alternative effect of its unusual sustained-release deodorancy as deodorant ingredient on the skin. This approach, specifically studied for the deodorant ingredients, could be applied to improve the durability of the active ingredient for cosmetics.

□Key words : glycosidically bound volatiles, fragrant precursor, deodorizing method, skin microflora, headspace analysis, eugenyl β -D-glucoside, raspberry ketone β -D-glucoside, phenylethyl β -D-glucoside, olfactory evaluation, deodorant efficacy

The Relationship between Sensitive Skin and Stratum Corneum Morphology*

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□“Sensitive skin” is an important problem in cosmetics research. Nowadays, there are still a few researches studied in this field. To evaluate the sensitive skin, in self-consciousness, we studied as follows: 1) factors affecting on the conscious sensitive skin, 2) seasonal variation affecting on the skin sensitivity, 3) relationship between sensitivity of the skin and morphology of the stratum corneum obtained by tape-stripping method. As the □results, it was suggested that 1) there are similar experience in the forming of the skin consciousness, 2) proportion of the conscious skin sensitivity is not changed within a year, but individuals are changed, 3) some of □the stratum corneum parameters correlated to the skin consciousness, projected surface area of the corneocyte □available for substantiate the skin sensitivity. Especially, the separation value of surface area which calculated □from theoretical value is most useful in the parameters. Questionnaire and separation value of corneocyte's surface area are useful tools to evaluate the skin sensitivity.

□Key words: skin sensitivity, stratum corneum, corneocyte surface area, nucleated cell, tape-stripping, gentian □violet, brilliant green, thick abrasion, cellular arrangement, seasonal variation □

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Development of Titanium Dioxide-Containing Silicone Polymer and Applications in Cosmetics*

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□Trimethylsiloxysilicate (TMS) is used in various types of cosmetics because it forms a protective film that is □highly water repellent, lubricating, and lasting. The authors tried to develop silicone polymers that contain titanium dioxide : (trimethylsiloxysilicate containing titanium dioxide TMST) to improve the optical properties of TMS. We prepared TMST by exploiting the sol-gel reaction to co-hydrolyze and polymerize silicone alkoxide □and titanium (IV) alkoxide, while trimethylsilylating the intermediates. The TiO₂ units in TMST were strongly bound to and homogeneously incorporated in the ≡Si-O-Si≡ network structure, rather than the simple □dispersion of particles of a fine titanium dioxide in TMS. The component units of TMST are [(CH₃)₃SiO_{1/2}]:[SiO₂]:[TiO₂](mol ratio 1.4: 1.2: 0.4). TMST is capable of forming film, which, although containing 9.0% titanium dioxide by weight, has good transparency because the titanium dioxide is highly dispersed and anchored. TMST retains the solubility of TMS, which has been a popular material for cosmetics, as well as the functional (transfer resistant and water repellent) film forming capabilities of TMS. In addition, TMST has the unique optical characteristics (higher refractive index and ultraviolet screening function) attributable to the titanium dioxide contained. These results demonstrated that TMST is very useful as a new functional film forming agent in cosmetics.

□Key words : silicone, silicone oils, silicones, silicone derivatives, titanium dioxide, polymers, metal alkoxides, hydrolysis, polymerization, soles, gels, film forming agents, solubility, transparency, adhesives, water resistance, sunscreens, lipsticks

The Relationship between Moisture Content of
Human Fingernails
and the Mechanical Properties of the
Fingernail(Part2)*

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□It is well known that nail damages such as yellowing, split nails and peeled nails (onychoschisis) are caused by continuous use of nail enamel for a long period. Within serious nail damages, we aimed at split nails and peeled nails and basically investigated the relationship between fingernail moisture content and the mechanical properties and the structure of fingernails to make clear the factors affecting those nail damages. As a result, fingernail moisture content was lower than plantar horny layer one. The change in fingernail volume due to moisture absorption was much more considerable in thickness than in length and width. It is suggested that the state of fingernail is changed by moisture absorption from the result of E' and $\tan \delta$ of the fingernail dipped in water. Moreover we propose the mechanism that cause split nails and peeled nails.

□Key words : moisture content, fingernail, mechanical property, nail enamel, trouble, split nail, peeled nail, structure, bending test, SEM image

Time Frequency Analysis of the Brain Waves
Variation by Cyclic Odor Stimulus*

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□Objective evaluation of psychophysiological effects is needed to develop the cosmetics with relaxation effectiveness. Recently, analyzing brain waves is used for evaluating these effects. For example, these effects are evaluated qualitatively by comparing power spectra of brain waves with and without stimulus. However quantifying variation in power spectra by stimulus is not easy, because the variation is affected by environment such as emotion, situation, etc. This paper proposed the new method for extracting the variation quantitatively. In this method, giving cyclic stimulus to human, the variation, which arises along the cycle, can be extracted by STFT (Short Time Fourier Transform) and FFT. Moreover, experimental system was

constructed based on our theories. Odor stimulus as peppermint and spearmint were tested, and the variations being able to extract quantitatively was shown. In case of peppermint, components of power spectra were increased in area of 4-6 Hz, and in spearmint, the components were also increased in 9-11 Hz. From these results, it was suggested that the proposed method was useful for objective evaluation of psychophysiological effects.

□Key words: STFT, time frequency analysis, FFT, power spectra, frequency analysis, cyclic stimulus, brain wave, odor, peppermint, spearmint

Properties of the Perfluoroalkylethyl Acrylate (FA)
Copolymers and

Their Applications for Cosmetics*
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Properties of the perfluoroalkylethyl acrylate (FA) copolymers and their applications for cosmetics were studied. The main conclusions from this study were summarized as follows : firstly, the FA copolymers which include hydrophobic comonomers made it possible to mix fluorinated compounds with non-fluorinated materials easily. This comes from the ability of FA copolymer to decrease the interfacial tension at fluorinated compound / non-fluorinated solvent. This technique can be applied to prepare the non-aqueous emulsion (perfluoropoly ether/non-fluorinated solvent type) and the foundations which contain a large quantity of fluorinated powders. Secondly, the FA copolymers which include hydrophilic comonomers made it possible to repel oil both in air and in water. Its behavior was demonstrated by the surface chemistry-based measurement used with flat substrate (PET film) and with powder substrate (talc). This technique may be applied to prepare the cosmetics which are durable against sebum in all environments.

□Key words : perfluoroalkylethyl acrylate copolymers, butylacrylate, silicone methacrylate, silicone mercaptane, polyethyleneglycol methacrylate, water and oil repellency, hybrid polymer, non-aqueous emulsion, sebum release polymer, contact angle, interfacial tension

Effect of Thermal Environmental Changes on the
Physical Characteristics of Human Hair*

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□Changes in the physical characteristics (surface friction and bending characteristics) and perceptual qualities of human hair during temperature and humidity change were evaluated using KES and a sensory evaluation method. The standard setting for the temperature and the humidity was 20□, 65% RH, while low and dry was 15□, 30% RH and high and humid was 30□, 80% RH. Ten strands of hair were taken from the head of Japanese woman in her 20s who had never had her hair chemically treated. The process of perming, brushing, bleaching and more brushing was repeated 4 times on 5 of the 10 healthy strands to create a damaged condition.□The healthy and damaged strands were then treated with typical cationic cellulose and silicone oil. We obtained the following results. 1) There was a correlation between the physical characteristics and sensory evaluation. 2) Both the healthy and damaged hair became smooth due to the reduced friction factor at high temperature and humidity. 3) Both the healthy and damaged hair became soft due to the reduced bending rigidity at high temperature and humidity. 4) It is easy to compare and examine the subtle differences due to various treatments□when the physical characteristics and sensory evaluation are performed under the standard conditions or low temperature and humidity conditions.

□Key words : environment, humidity, hair, silicones, cationic cellulose, bending, friction, KES, surface, MIU