

# Abstracts

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**Non-Invasive Techniques to Measure Physiological Properties of the Skin and Their Application to Efficacy Test of Skin Care Products**  
Motoji Takahashi, Research Center, Shiseido Co., Ltd.

Many techniques have been developed to measure non-invasively ranging from physical to physiological properties of the skin i.e. mechanical, electrical, thermal, optical, photoacoustic properties, perspiration, sebum secretion, blood flow, and skin metabolic rate. They are applied to the efficacy test of cosmetic products and ingredients, or to the examination and the classification of skin condition. In this paper each method which measure skin surface topography, skin hydration, barrier function, turnover time of stratum corneum, parakeratosis, free amino acids in stratum corneum, wrinkle, spots and skin internal structure (ultrasound techniques and in vivo confocal microscopy) is described from the standpoint of the principle and application.

**Fragrances and Their Special Properties—Antibacterial and Antioxidant Activity of Fragrance Materials and Aromas Used as a Tool of Non-Verbal Communication—**  
Toru Asakoshi, Fragrance Institute, T. Hasegawa Co., Ltd.

In general, odors are everything one can sense while aromas are something which will give comfort and relaxation. Whether particular aroma is said to be good or bad will largely depend on ones' own personal experiences or cultural background. Fragrance materials are narrowly defined as products handled by the fragrance industry, while more broadly, they

are everything which will bring about aromas. Primary objective of the use of fragrance materials in the final products is of course to help enhance an artistic value, attractiveness or comfortness of such products. This is basically what the fragrances are for. In addition to these, they also possess many other functions. Of these, I will discuss the antibacterial and antioxidative aspects which are said to be two of the most representative functions. As we become more keenly aware now that we are being exposed to the counterattack by microorganisms and to the harmful sunlight or being damaged by the oxygen, the studies on these characteristics are getting attention among researchers. As the same time, I will discuss also the role of aromas in terms of non-verbal communication as viewed in a cultural context. It should be reminded once again that the very basic and essential function of fragrance materials is after all to give aromas.

**Development of New Evaluation Method for Whitening Agents by Using the Effect of  $\alpha$ -MSH or Endothelin-1 on Normal Melanocytes**  
Yasunobu Ochiai, Kousuke Torii, Yuri Okano, Hitoshi Masaki, Kobe Research Laboratory, NOEVIR Co., Ltd.

It has been reported that  $\alpha$ -MSH and Endothelin-1, which are secreted from keratinocytes or melanocytes by UV irradiation, are responsible for the pigmentation of skin according to the increasing of tyrosinase activity. To prevent or improve the pigmentation due to UV-irradiation, we notice the blocking of the actions induced by  $\alpha$ -MSH or Endothelin-1. In this study, we established a conve-

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nient evaluation method for the blocking of the cytokine-induced reactions. The tyrosinase activity in normal human melanocytes was used as an index of the cytokine-induced reaction. With this method, it was found that certain plant extracts showed the blocking effect for increasing tyrosinase activity, *Artemisia capillaris* Thunberg and *Sanguisorba officinalis* L. for  $\alpha$ -MSH and *Achillea millefolium* L., *Carthamus tinctorius* L., *Eupatorium fortunei* Turcz., *Polygonum cuspidatum* Sieb. and *Thymus vulgaris* L. for Endothelin-1. No alterations of these plants on tyrosinase activity in normal human melanocytes suggested that the blocking on the cytokine action contributed to their effects.

#### **A Novel Technique for Preventing Pigment Sedimentation in Nail Enamels**

Kazuhiro Ishida, Masaki Okuyama, Yuki Mizutani, Shigeyoshi Momose, Product Development Research Laboratory, Fundamental Research Laboratory, KOSE Corporation

To prevent sedimentation of inorganic pigments used in nail enamels, we studied a surface treatment of the pigment, using a titanium dioxide. We selected a variety of fluorides to improve the electrostatic repulsion by the pigment's surface charge and adsorption of resins on the pigment surface. The result indicated that the pigments had excellent electrostatic repulsion as well as excellent resin adsorption. Our experiments with pigment dispersion containing these pigments confirmed that the particle diameter did not change with time and that pigment aggregation did not occur. Nail enamels formulated with these pigments offer extremely stable dispersion. Within this group, pigments surface treated with perfluoroalkyl phosphate were the most effective in preventing sedimentation and that a dispersion stability of 5 times or longer than the conventional life cycle could be obtained.

#### **Theory and Its Practical Application for Permanent Hair Straightening**

Satoshi Ogawa, Kazuki Fujii, Katsumi Kaneyama, Kozo Arai, Kyohei Joko, Research and Development Center, Milbon Co. Ltd., Kyoto Women's Junior College, Kyoto Women's University

A method for permanent hair straightening was studied by applying a heat iron technique to the hairs reduced with a solution containing thioglycolic acid (TGA) and dithiodiglycolic acid (DTDG) before oxidation treatment. The effectiveness of straightening was evaluated as a function of the de-

gree of supercontraction observed on the treatment hairs, which was greatly dependent on pH and the concentrations of TGA and DTDG in reducing system. On the experimental and practical bases, a range of around 5 to 8% supercontraction was found to be necessary to achieve successful permanent hair straightening. High pressure differential scanning calorimetry was used to estimate the  $\alpha$ -helix content. From the relationship between the melting enthalpy and the degree of supercontraction of the hair, an important suggestion was made that the supercontraction within 10%—is caused by the randomization of the  $\alpha$ -helix, and permanency related to the hair straightening is a result of the transformation of  $\alpha$ -crystal phase into amorphous phase.

## **Volume 34, No. 2, 2000**

#### **Guiding Principles for R&D of Materials**

Hiroaki Yanagida, Research Institute, Japan Fine Ceramics Center

Demerit of recent and a so-called advanced technology is frequently observed since some of them is too much complicated. Plain technology is friendly to environment and people. Guiding principles for R&D of materials based upon priorities given to brevity are explained. Logo-mark of Ken-Materials Research Consortium consists of words with Chinese characters pronounced as "Ken." Those involve wisdom of autonomy, structural reliability, functional capability, integration, simplicity, soundness and environmental friendliness. This technological movement aims establishment of techno-democracy.

#### **Functional Silicones in Cosmetic Applications**

Tetsuo Nakanishi, Silicone-Electronics Materials Research Center, Shin-Etsu Chemical Co., Ltd.

As utilizing unique properties of the silicones, they had the achievements to be widely used by many industry fields. And it also made a contribution to improvements in various fields of cosmetics. The silicones, however, were used for only additives or substitutes in the cosmetic applications. We have energetically studied the silicone resins and powders. We finally succeeded in the development of unique silicone products for main ingredients of cosmetics, which obtained a characteristic and function that could not achieve by current technology. With this general remarks, we give an overview of various silicone products and details of the newly developed acryl silicone resins and powders.

### Development of Skin Lotion Based on Wine Component

Aki Soejima, Kimio Shimamura, Hirofumi Kuwahara, Yutaka Aoki, Akinori Haratake, Takeshi Ike-moto, Cosmetics Laboratory, Basic Research Laboratory, Kanebo Ltd.

Wine composition varies with the grape variety, time of harvest, soil composition, climate and wine-maker. And there have been many reports concerning the differences of wine composition. Major components of wine, such as alpha hydroxyacids (AHAs), glycerol and sugars, are also known as cosmetics ingredients. Although, the ability of AHAs to affect wrinkling have been reported, there was few report concerning the function and effect of wine on the skin. To develop novel skin treatment lotion, we analyzed various kinds of wine and discussed its composition as skin treatment lotion. We confirmed that one of them possessed desirable features and function as a skin treatment lotion. And we also confirmed that ethylglucoside, one of typical ingredient of novel rot, markedly reduced the irritating side effects of AHAs. There results suggested that the possibility to develop novel skin treatment lotion based on wine composition.

### Application of Aroma Formation Mechanism of Plants to Odor Control

Noriaki Oka\*2, Takashi Ya\*3, Masanori Okada\*4, R&D Laboratories, POLA Chemical Industries Inc.\*2\*3\*4

By studying the mechanism of aroma release in rose plants, we developed of a new effective method of harvesting the aroma from roses, and utilized this mechanism for controlling odor in several novel cosmetic and household products. After extracting aromatic precursors from the residue of aroma production, we reacted them with commercial hydrolytic enzymes or sulfuric acid, followed by determining the quality and quantity of the fragrance compounds obtained. We were successful in recovering aromatic materials from the aqueous residue following steam distillation of frozen Bulgarian roses. We believe that this method shows promise as a novel and very effective way of thoroughly extracting fragrance components. Understanding of this mechanism also allowed us to develop unique products. We incorporated aromatic precursors ( $\beta$ -galactosides) into deodorant hair tonic, and detected aroma release from hair after the use of the tonic. We also imbedded disposable diapers with a combination of these aromatic precursors ( $\beta$ -galactosides), clathrate fragrances and deodorant powders. We found that the diapers could mask urine odor effectively for 24h. These experiments show that this mechanism for

odor control has many practical applications in a variety of interesting products.

### Polymer Analysis by Improved Pyrolysis-Gas Chromatography Hyphenated with Foul. Specific Detectors

Kazuyoshi Nakahara, Seiichi Yoshida, Kazuo Komatsu, Katsumi Ishiwata, Okihiko Sakamoto, Analytical Chemistry Section, Shiseido Basic Research Center

A novel pyrolysis tube was constructed for pyrolysis-gas chromatography (Py-GC). Simplification of pre-treatment and reduction of operating time were achieved by use of the pyrolysis tube. Py-GC with an electron ionization mass spectrometer (Py-GC-EIMS), a chemical ionization mass spectrometer (Py-GC-CIMS), an atomic emission detector (Py-GC-AED) and infrared spectrometer (Py-GC-IR) were used to identify the pyrolysates produced by pyrolysis of polydimethylsiloxane (DMS). It was possible to have a detailed structure of DMS and volatile impurities included in DMS by the combined use of those specific detectors. Difference in retention time among the same pyrolysates which were obtained by those detectors was recognized. However, these difference was able to be corrected by retention index (RI) calculated retention times of normal saturated hydrocarbons appeared in a pyrogram of polyethylene standard. Each relative standard deviation (RSD) which was calculated by five RIs of the same peaks was less than 0.6%, therefore it was possible to construct "an unified pyrolysates library" which was based on RIs. M/Q ratios (M/Q) of three trimethylsiloxysilicates, which indicate molecular ratios of M units to Q units, were calculated by conventional  $^{29}\text{Si-NMR}$ . And total carbon area/total silicon area ratios (C/Si) were calculated by carbon and silicon pyrogram of Py-GC-AED. A linear relationship ( $r = 0.9997$ ) between M/Q ratio and C/Si ratio was recognized, therefore that relationship has enabled to establish calculating method of M/Q ratio by the use of Py-GC-AED. Establishment of method for identification of unknown pyrograms was attempted, however each reproducibility of match qualities evaluated by library search of total EIMS spectra obtained from total ion pyrograms of poly (acrylic acid) was slightly lower than expected value. It is necessary to determine the optimum conditions of total EIMS spectra and parameters of retrieval.

### Study on the Mechanisms Associated with Dark Circles

Masayuki Matsumoto, Noriko Kobayashi, Osamu Hoshina, Seiichi Arai Cosmetics Laboratory, Kanebo Ltd.

The factors that are conventionally suggested as being responsible for the dark circles around the eyes include the retention of blood and poor circulation. In actual fact, however, reports of measurements of blood flow around the eyelid are scarce, and the literature is silent on research into any direct relationship between dark circles and the kinetics of blood flow. In the present work, we used a laser Doppler flowmeter and depthprobe to measure at four different depths, the hemodynamic parameters of blood flow (Flow), mass (Mass), and velocity (Vel.), in a bid to elucidate the circulatory kinetics at the site of formation of dark circles. We also sought to shed more light on the phenomenon of dark circles by measuring skin color and skin surface temperature at the same site. In the periphery of the internal canthus, where dark circles are more readily formed, we found that blood mass (Mass) was high and blood velocity (Vel.) was slow at the skin surface. We also demonstrated that the retention of blood, conventionally regarded as occurring at the site of formation of dark circles, can be characterized by greater blood mass (Mass) and slower blood velocity (Vel.). As well, the skin brightness ( $L^*$ ) was low in the periphery of the internal canthus, and was correlated with blood mass (Mass), suggesting that retention of blood in the surface of the skin may be a significant factor in the development of dark circles.

#### **The Relationship between Moisture Content of Human Fingernails and the Mechanical Properties of the Fingernail (Part 3)**

Tooru Sugawara, Mizue Kawai, Toshiyuki Suzuki, Cosmetic Research Laboratories, Kao Corporation

It is well known that nail damages such as yellowing, split nails and peeled nails (onychoschisis) is 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 effect of organic solvents on fingernail moisture content and the mechanical properties to make clear the factors affecting those nail damages. As a result, the change in fingernail volume of fingernail dipped in water was much more considerable than that dipped in organic solvents. It is suggested that the fingernails dipped in organic solvents is harder and brittle than the fingernails dipped in water from the result of  $E'$  and  $\tan$  of the fingernails dipped in water and organic solvents. Moreover we proposed the mechanism of the split nails caused by organic solvents.

#### **Optical Characteristic of Zirconia Coated Spherical Complex Silica and Application to Cosmetic Foundations**

Motoaki Ito, Noboru Nagatani, Masahiko Asahi, Toshiyuki Suzuki, Skin Care Research Laboratories, Kao Corporation

One of the important functions for cosmetic foundations is to conceal pores of the skin. In order to search for powders that can both conceal pores and provide a natural finish, we evaluated various powders by measuring the chrominance and luminosity. As a result, the zirconia coated spherical silica including titania (TSZ) was the most effective powder. The reasons for the effectiveness of TSZ were assumed as follows: (1) the optical characteristic due to the complex structure consisting of a high refractive index inclusion which provides coverage, and a moderate refractive index substance which covers the outmost layer; (2) the spherical shape allowing it to be applied in the pores selectively. By applying TSZ to cosmetic foundations, we obtained products that conceal pores effectively and yet offer natural finish.