

〈一般論文〉

マイクロ波分解–誘導結合プラズマ質量分析法による 化粧品中の微量金属不純物分析法の検討

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Analytical Method for Trace Metal Impurity in Cosmetic Products by Microwave Digestion-Inductively Coupled Plasma-Mass Spectrometry

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Abstract

Currently, international discussions to establish acceptable trace heavy metal levels in finished cosmetic products and their testing methods are ongoing. In Japan, the testing methods and acceptable levels of heavy metals in raw materials have already been specified with the Japanese Standards of Quasi-drug Ingredients, but no specification regarding their testing methods and levels in finished cosmetic products has been published. In order to assess trace metal impurity in cosmetic products, an analytical method for determining 13 metals in finished cosmetic products by using microwave-assisted digestion and inductively coupled plasma-mass spectrometry was developed and validated. Because cosmetic products contain ingredients in various dosage forms, including various fats, oils, pigments, dyes, and minerals, microwave digestion conditions for the preparation of sample solution were mainly investigated using oil-based reference standard solution and certified reference material (CRM) (Lake sediment CRM, for trace elements analysis). In the recovery test using an oil-based reference standard solution, good recovery and repeatability were achieved under the developed acid digestion conditions using HNO_3 ; HNO_3 and H_2O_2 ; and HNO_3 and HF. However, in terms of recovery from lake sediment CRM, good recovery from the CRM was achieved, and high concentrations (the value closest to the true concentration) in the commercial cosmetic products for each metals were obtained only when using HNO_3 and HF for digestion. Therefore, HNO_3 and HF were used in the microwave digestion treatment of commercial 59 lipsticks, 23 lip glosses, and 20 lip liners. The metals detected at high concentrations and frequencies were Zn, Sr, and Sn for lipstick; Zn and Sn for lip gloss; and Mn, Zn, Sr, and Sn for lip liner. These metals were likely derived from zinc oxide, tin oxide, and manganese violet those were labeled ingredients on the product. Compared to the recommended acceptable levels of Pb, As, Cd, and Sb in cosmetic products by International Cooperation on Cosmetics Regulation (ICCR) and Health Canada, the concentration of Sb in some of the tested products exceeded the acceptable level.

Key words: cosmetic products, heavy metals, impurity, microwave digestion-ICP-MS, HF.