Common Fragrance and Flavor Materials: Preparation and Uses, Fourth, Completely Revised Edition
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4 Quality Control

Quality control of fragrance and flavor substances as well as the products derived from them, comprises the comparison of sensory, analytical and if necessary, microbiological data with standards and specifications. To a large extent these have been established in official specification collections (Pharmacopoeias, ISO, AFNOR, Essential Oil Association).

In the past few decades, a precise methodology has been developed for sensory evaluation and has proved to give reliable results [826]. Increasingly, in recent years chemical sensor systems ('electronic noses') are used for such purposes [826a].

The analytical determination of identity and purity aids greatly in establishing the acceptability of fragrance and flavor materials. To meet the customer requirements all of these methods should be validated by quality assurance tools [827].

Single fragrance and flavor materials are identified by generally accepted analytical parameters such as density, refractive index, optical rotation, and melting point. The advantage of these methods is the short analysis time, which provides assessment criteria allowing comparison with other laboratories all over the world. Spectroscopic methods such as infrared (IR) and near infrared (NIR) are becoming more important for fast identification checks [828, 829]. NIR techniques may also be used for identification of single and complex fragrance and flavor materials [830].

Content, as well as impurity determinations, are done by chromatographic procedures such as gas chromatography (GC), high pressure liquid chromatography (HPLC) [831], capillary electrophoresis (CE) [832], and by spectroscopic techniques (UV, IR, MS, and NMR) [833, 834].

Fast GC is being used for quality and in-process control to give detailed results within a few minutes [835–835b].

For the analysis of complex mixtures, modern coupling techniques such as GC-MS, GC-FTIR, HPLC-MS, CE-MS and comprehensive two-dimensional GC [832, 836–838a] are valuable and sometimes essential tools.

Classical sample preparation methods such as distillation, soxhlet extraction are still used [839, 840], but specific techniques such as supercritical fluid extraction (SFE) [841], and increasingly in recent years, adsorption techniques such as solid phase micro-extraction (SPME) [841a] are also being used for isolation, separation, and identification of flavor and fragrance materials.

For the administration of products, methods, and analytical data modern analytical quality control labs use powerful information and management systems (LIMS) [842].

Standardization of specifications for complex fragrance and flavor materials, such as essential oils and absolutes, is far more difficult than for single compounds.

In addition to sensory and physical properties, the content of certain typical components is determined. Problems concerning the natural, botanical, and geographical origins of these products are also solved by using modern chromatographic methods such as enantiomer separations [843–843c], and spectroscopic analytical techniques such as isotope ratio mass spectrometry (IRMS) [844–844b].

The determination of trace components (halogens, heavy metals, pesticides, aflatoxins, and restsolvents) in flavor and fragrance materials used in foods and cosmetics is becoming increasingly important.