

ICS 65.160
X 85



中华人民共和国国家标准

GB/T 21133—2007/ISO 18144:2003

GB/T 21133—2007/ISO 18144:2003

环境烟草烟气 可吸入悬浮颗粒物的估测 茄呢醇法

Environmental tobacco smoke—Estimation of its contribution to respirable
suspended particles—Method based on solanesol

(ISO 18144:2003, IDT)

中华人民共和国
国家标准
环境烟草烟气 可吸入悬浮颗粒物的估测
茄呢醇法

GB/T 21133—2007/ISO 18144:2003

*

中国标准出版社出版发行
北京复兴门外三里河北街16号
邮政编码:100045

网址 www.spc.net.cn

电话:68523946 68517548

中国标准出版社秦皇岛印刷厂印刷
各地新华书店经销

*

开本 880×1230 1/16 印张 1 字数 20 千字
2008年1月第一版 2008年1月第一次印刷

*

书号:155066·1-30396 定价 16.00 元

如有印装差错 由本社发行中心调换
版权专有 侵权必究

举报电话:(010)68533533



GB/T 21133-2007

2007-10-16 发布

2008-01-01 实施

中华人民共和国国家质量监督检验检疫总局
中国国家标准化管理委员会 发布

- [14] Phillips, K. , Bentley, M. C. , Abrar, M. , Howard, D. A./and Cool, J. Low Level Saliva Cotinine Determination and Its Application as a Biomarker for Environmental Tobacco Smoke Exposure. *Human and Experimental Toxicology*, 18 (4), 1999, pp. 291-296.
- [15] Jenkins, R. A. , Guerin, M. R. and Tomkins, B. A. The Chemistry of Environmental Tobacco Smoke: Composition and Measurement. Indoor Air Research Series, 2nd Edition, Lewis Publishers, Boca Raton, FL, 2000.
- [16] Owen, M. K. , Ensor, D. S. and Sparks, L. E. Airborne Particle Sizes and Sources Found in Indoor Air, *Atmospheric Environment*, 26A (12), 1992, pp. 2149-2162.
- [17] Spengler, J. D. , Treitman, R. D. , Tosteson, T. D. , Mage, D. T. , and Soczek, M. L. Personal Exposures to Respirable Suspended Particulates and Implications for Air Pollution Epidemiology. *Environmental Science & Technology*, 19, 1985, pp. 700-707.
- [18] Conner, J. M. , Oldaker, G. B. III, and Murphy, J. J. Method for Assessing the Contribution of Environmental Tobacco Smoke to Respirable Suspended Particles in Indoor Environments. *Environmental Technology*, 11, 1990, pp. 189-196.
- [19] Proctor, C. J. A Multi-analyte Approach to the Measurement of Environmental Tobacco Smoke. Indoor Air Quality and Ventilation, Selper, London, 1990, pp. 427-436.
- [20] Ogden, M. W. and Maiolo, K. C. Collection and Determination of Solanesol as a Tracer of Environmental Tobacco Smoke in Indoor Air. *Environmental Science and Technology*, 23 (9), 1989, pp. 1148-1154.
- [21] Jenkins, R. A. , Palausky, A. , Counts, R. W. , Bayne, C. K. , Dindal, A. B. and Guerin, M. R. Exposure to Environmental Tobacco Smoke in Sixteen Cities in the United States as Determined by Personal Breathing Zone Air Sampling. *Journal of Exposure Analysis and Environmental Epidemiology*, 6 (4), 1996, pp. 473-502.
- [22] ISO 7708:1995, Air quality—Particle size fraction definitions for health-related sampling.
- [23] Ogden, M. W. and Richardson, J. D. Effect of Lighting and Storage Conditions on the Stability of Ultraviolet Particulate Matter, Fluorescent Particulate Matter, and Solanesol. *Tobacco Science*, 42, 1998, pp. 10-15.
- [24] Nelson, P. R. , Conrad, F. W. , Kelly, S. P. , Maiolo, K. C. , Richardson, J. D. and Ogden, M. W. Composition of Environmental Tobacco Smoke (ETS) from International Cigarettes and Determination of ETS-RSP: Particulate Marker Ratios. *Environment International*, 23(1), 1997, pp. 47-52.
- [25] Nelson, P. R. , Conrad, F. W. , Kelly, S. P. , Maiolo, K. C. , Richardson, J. D. and Ogden, M. W. Composition of Environmental Tobacco Smoke (ETS) from International Cigarettes, Part 2: Nine Country Follow-up. *Environment International*, 24 (3), 1998, pp. 251-257.
- [26] ISO 5725-1:1994, Accuracy (trueness and precision) of measurement methods and results—Part 1: General principles and definitions.

前 言

本标准等同采用国际标准 ISO 18144:2003《环境烟草烟气 可吸入悬浮颗粒物的估测 茄呢醇法》(英文版)。本标准在技术内容上与 ISO 18144:2003 等同。

本标准的附录 A 为资料性附录。

本标准由国家烟草专卖局提出。

本标准由全国烟草标准化技术委员会(TC 144)归口。

本标准起草单位:国家烟草质量监督检验中心。

本标准主要起草人:唐纲岭、谢复炜、王昇、赵乐、刘惠民。

引 言

环境烟草烟气(ETS)是由气相物和粒相物组成的一种气溶胶。由于气相物和粒相物性质上的差异,导致两者之间缺乏关联性,因而准确评价室内空气中环境烟草烟气的含量水平需要测定对两相都适合的标示物。在理想的环境烟草烟气标记物应具备的所有条件中,最关键的一条是环境条件在一定范围时,标示物必须与某一污染物或某一类污染物(如悬浮颗粒)保持相当稳定的比例关系(见参考文献[1])。

注:参考文献目录给出了引用的所有参考文献。

茄呢醇,一种C₄₅类异戊二烯醇,在各种通风条件和采样时间下均与烟草烟气的可吸入悬浮颗粒物保持一恒定的比例关系(见参考文献[2]),因此满足这一要求。依据ISO 15593测定的紫外粒相物和荧光粒相物也同样是满足这一要求的标示物或标记物(见参考文献[3])。但大气中茄呢醇的独特性在于它是烟草烟气特有的、且只存在于环境烟草烟气的粒相物中。茄呢醇的高分子量和低挥发性使之不可能从样品采集膜上遗失。茄呢醇约占环境烟草烟气可吸入悬浮颗粒物总质量的3%(见参考文献[4]~[6]),这样高的含量在实际的人群抽烟比例频次条件下都适合于测定。在可供利用的环境烟草烟气粒相标记物(紫外粒相物、荧光粒相物和茄呢醇)中,三者目前都有使用且可以依赖,而茄呢醇被认为是环境烟草烟气粒相物的一个比较好的标记物,因此也是评价环境烟草烟气粒相物对可吸入悬浮颗粒物影响的最好的量化方法(见参考文献[7]~[15])。

由于可吸入悬浮颗粒物不是烟草烟气特有的,所以用烟草特有的标记物量化环境烟草烟气对可吸入悬浮颗粒物的影响是非常重要的。可吸入悬浮颗粒物是衡量总体空气质量的一个非常必要的指标,美国职业安全与健康管理局(OSHA)曾规定工作场所内可吸入粉尘的最高允许量为5 000 μg/m³。然而,可吸入悬浮颗粒物的来源很多(见参考文献[16]),已经证明其不适合于作为环境烟草烟气的标记物(见参考文献[4],[17]~[19])。用紫外粒相物和荧光粒相物作为标记物估测环境烟草烟气对可吸入悬浮颗粒物的影响具有一定的选择性。但是,由于存在潜在的非烟草燃烧产生的干扰,这两种标记物可能会过高的估测环境烟草烟气对可吸入悬浮颗粒物的影响。虽然紫外粒相物和荧光粒相物对考查室内空气质量有用,但茄呢醇是估测烟草烟气对可吸入悬浮颗粒物影响的一种更好的标记物。本标准描述的测试方法通过测定茄呢醇与总可吸入悬浮颗粒物的质量比,将环境烟草烟气来源与非环境烟草烟气来源的可吸入悬浮颗粒物区分开来(见参考文献[4],[6],[10],[11],[14],[15],[20],[21])。

烟属,其中一个种为烟草,是茄科植物的一属。像烟草一样,这一科中的许多植物,尤其是含有痕量烟碱的植物,均含有茄呢醇。例如,西红柿、马铃薯、茄子和胡椒。烹饪是产生干扰的唯一可能来源,因此这种潜在的干扰可以忽略。但是,如果有这种干扰源的存在,茄呢醇的量会非常高,环境烟草烟气对可吸入悬浮颗粒物影响的测定结果就会偏高。可以预料,室内环境中正常量的茄呢醇的唯一来源是烟草的燃烧。在各种室内环境中,茄呢醇的浓度范围在未检出至2 μg/m³,且大多数情况下在此范围的下限。

参 考 文 献

- [1] National Research Council, *Environmental Tobacco Smoke—Measuring Exposures and Assessing Health Effects*, National Academy Press, Washington, DC, 1986, p. 70.
- [2] Nelson, P. R., Heavner, D. L., Collie, B. B., Maiolo, K. C. and Ogden, M. W. Effect of Ventilation and Sampling Time on Environmental Tobacco Smoke Component Ratios, *Environmental Science & Technology*, 26 (10), 1992, pp. 1909-1915.
- [3] ISO 15593:2001, Environmental tobacco smoke—Estimation of its contribution to respirable suspended particles—Determination of particulate matter by ultraviolet absorbance and by fluorescence.
- [4] Ogden, M. W., Maiolo, K. C., Oldaker, G. B. 111, and Conrad, F. W. Jr. Evaluation of Methods for Estimating the Contribution of ETS to Respirable Suspended Particles. *Indoor Air '90; Proceedings of the 5th international Conference on Indoor Air Quality and Climate*, International Conference on Indoor Air Quality and Climate, Ottawa, 1990, Vol. 2, pp. 415-420.
- [5] Tang, H., Richards, G., Benner, C. L., Tuominen, J. P., Lee, M. L., Lewis, E. A., Hansen, L. D. and Eatough, D. J. Solanesol—A Tracer for Environmental Tobacco Smoke Particles. *Environmental Science and Technology* 24, (6), 1990, pp. 848-852.
- [6] Heavner, D. L., Morgan, W. T. and Ogden, M. W. Determination of Volatile Organic Compounds and Respirable Suspended Particulate Matter in New Jersey and Pennsylvania Homes and Workplaces. *Environment International*, 22(2), 1996, pp. 159-183.
- [7] Ogden, M. W. and Maiolo, K. C. Comparison of GC and LC for Determining Solanesol in Environmental Tobacco Smoke. *LC-GC Magazine*, 10(6), 1992, pp. 459-462.
- [8] Guerin, M. W. and Tomkins, B. A. *The Chemistry of Environmental Tobacco Smoke: Composition and Measurement*, Lewis Publishers, Chelsea, MI, 1992.
- [9] Eatough, D. J. Assessing Exposure to Environmental Tobacco Smoke. Modeling of Indoor Air Quality and Exposure, ASTM STP 1205, N. L. Nagda (ed.), ASTM, 1993, pp. 42-63.
- [10] Phillips, K., Howard, D. A., Browine, D. and Lewsley, J. M. Assessment of Personal Exposures to Environmental Tobacco Smoke in British Nonsmokers. *Environment International*, 20 (6), 1994, pp. 693-712.
- [11] Phillips, K., Bentley, M. C., Howard, D. A. and Alvan, G. Assessment of Air Quality in Stockholm by Personal Monitoring of Nonsmokers for Respirable Suspended Particles and Environmental Tobacco Smoke. *Scandinavian Journal of Work, Environment and Health*, 22, Supplement 1, 1996, pp. 239-250.
- [12] Sterling, E. M., Collett, C. W. and Ross, J. A. Assessment of Non—Smokers' Exposure to Environmental Tobacco Smoke Using Personal—Exposure and Fixed—Location Monitoring. *Indoor Built Environment*, 5, 1996, pp. 112-125.
- [13] Ogden, M. W., Heavner, D. L., Foster, T. L., Maiolo, K. C., Cash, S. L., Richardson, J. D., Martin, P., Simmons, P. S., Conrad, F. W., and Nelson, P. R. Personal Monitoring System for Measuring Environmental Tobacco Smoke Exposure. *Environmental Technology*, 17, 1996, pp. 239-250.