



中华人民共和国国家标准

GB/T 30702—2014/ISO 18118:2004

GB/T 30702—2014/ISO 18118:2004

表面化学分析 俄歇电子能谱和 X 射线 光电子能谱 实验测定的相对灵敏度 因子在均匀材料定量分析中的使用指南

Surface chemical analysis—Auger electron spectroscopy and X-ray photoelectron spectroscopy—Guide to the use of experimentally determined relative sensitivity factors for the quantitative analysis of homogeneous materials

(ISO 18118:2004, IDT)

中华人民共和国
国家标准
表面化学分析 俄歇电子能谱和 X 射线
光电子能谱 实验测定的相对灵敏度
因子在均匀材料定量分析中的使用指南
GB/T 30702—2014/ISO 18118:2004

*
中国标准出版社出版发行
北京市朝阳区和平里西街甲 2 号(100029)
北京市西城区三里河北街 16 号(100045)
网址 www.spc.net.cn
总编室:(010)64275323 发行中心:(010)51780235
读者服务部:(010)68523946
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 1.75 字数 39 千字
2014 年 12 月第一版 2014 年 12 月第一次印刷

*
书号: 155066·1-49756 定价 27.00 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)68510107



GB/T 30702-2014

2014-06-09 发布

2014-12-01 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

effects in scanning Auger electron microscopy, *Journal of Applied Physics*, Jan.1983, Vol.54, No.1, pp. 374-381.

[51] ASTM E 983-94, Standard guide for minimizing unwanted electron beam effects in Auger electron spectroscopy.

[52] Thomas, J. H.: Photon beam damage and charging at solid surfaces, in beam effects, Surface Topography, and Depth profiling in Surface analysis, Eds. Czanderna, A. W., Madey, T. E., and Powell, C. J., Plenum press, New York, 1998, pp.1-37.

[53] Pantano, C. G., D'Souza, A. S., and Then, A. M.: Electron beam damage at solid surfaces, in Beam Effects, Surface Topography, and Depth Profiling in Surface Analysis, Eds. Czanderna, A. W., Madey, T. E., and Powell, C. J., Plenum Press, New York, 1998, pp.39-96.

[54] Shimizu, H., Ono, M., and Makayama, K.: Effect of target temperature on surface composition changes of Cu-Ni alloys during Ar ion bombardment, *Journal of Applied Physics*, Jan.1975, Vol. 46, No.1, pp.460-462.

[55] Ho, P. S., Lewis, J. E., Wildman, H. S., and Howard, J. K.: Auger study of preferred sputtering on binary alloy surfaces, *Surface Science*, July 1976, Vol.57, No.2, pp.393-405.

[56] Dake, L. S., King, D. E., Pitts, J. R., and Czanderna, A. W.: Ion beam bombardment effects on solid surfaces at energies used for sputter depth profiling, in Beam effects, Surface Topography, and Depth Profiling in Surface Analysis, Eds. Czanderna, A. W., Madey, T. E., and Powell, C. J., Plenum press, New York, 1998, pp.97-274.

目 次

前言	III
引言	IV
1 范围	1
2 规范性引用文件	1
3 术语和定义	1
4 符号和缩略语	2
5 概述	2
6 测量条件	3
6.1 概述	3
6.2 激发源	3
6.3 能量分辨率	3
6.4 能量步长和扫描速率	3
6.5 信号强度	3
6.6 增益和时间常数(适用于模拟信号探测系统的 AES 仪器)	3
6.7 调制获取微分谱	4
7 数据分析步骤	4
8 强度能量响应函数	4
9 用相对灵敏度因子测定化学组成	4
9.1 化学组成的计算	4
9.2 计算组成的不确定度	5
附录 A (规范性附录) 相对灵敏度因子公式	6
A.1 符号和缩略语	6
A.2 原理	7
A.3 相对灵敏度因子	8
附录 B (资料性附录) 分析结果的不确定度信息	15
B.1 符号和缩略语	15
B.2 引言	15
B.3 基体效应	15
B.4 样品组分分布	16
B.5 表面形貌	16
B.6 辐照损伤	16
B.7 离子溅射影响	16
B.8 表面污染	16
参考文献	17

[18] Seah, M.P.: XPS reference procedure for the accurate intensity calibration of electron spectrometers—Results of a BCR intercomparison (sponsored by the VAMAS SCA TWA), *Surface and Interface Analysis*, Mar.1993, Vol.20, No.3, pp.243-266.

[19] Powell, C.J., and Seah, M.P.: Precision, accuracy, and uncertainty in quantitative surface analyses by Auger-electron spectroscopy and X-ray photoelectron spectroscopy, *Journal of Vacuum Science and Technology A*, Mar./Apr.1990, Vol.8, No.2, pp.735-763.

[20] Childs, K.D., Carlson, B.A., Lavanier, L.A., Moulder, J.F., Paul, D.F., Stickle, W.F., and Watson, D.G.: *Handbook of Auger Electron spectroscopy*, Third Edition, Physical Electronics Inc., Eden Prairie, MN, 1995.

[21] Yoshihara, K., Shimizu, R., Homma, T., Tokutaka, H., Goto, K., Umehara, M., Fujita, D., Kurokwa, A., Ichimura, S., Oshima, C., Kurahashi, M., Kudo, M., Hashiguchi, Y., Fukuda, Y., Suzuki, T., Ohmura, T., Sodea, F., Tanaka, A., Sekine, T., Shiokawa, Y., and Hayashi, T.: Quantitative surface chemical analysis of Au-Cu alloys with AES, *Surface and Interface Analysis*, Jul.1988, Vol.12, Nos.1-12, pp.125-130.

[22] Yoshitake, M., and Yoshihara, K.: Quantitative surface chemical analysis of Au-Cu alloys with XPS, *Surface and Interface Analysis*, Sep.1991, Vol.17, No.10, pp.711-718.

[23] Tanuma, S., Sekine, T., Yoshihara, K., Shimizu, R., Homma, T., Tokutaka, H., Goto, K., Umemura, M., Fujita, D., Kurokawa, A., Ichimura, S., Oshima, C., Kurahashi, M., Kudo, M., Hashiguchi, Y., Suzuki, T., Ohmura, T., Soeda, F., Tanaka, K., and Tanaka, A.: Evaluation of correction accuracy of several schemes for AES matrix corrections, *Surface and Interface Analysis*, Aug.1990, Vol.15, No.8, pp.466-472.

[24] Seah, M.P.: Quantification of AES and XPS, in *Practical Surface Analysis*, 2nd edition, Eds.D.Briggs and M.P.Seah, Wiley, Chichester (1990), pp.201-255.

[25] Jablonski, A., and Powell, C.J., Evaluation of correction parameters for elastic-scattering effects in X-ray photoelectron spectroscopy and Auger electron spectroscopy, *Journal of Vacuum Science and Technology A*, Jul./Aug.1997, Vol.15, No.4, pp.2095-2106.

[26] Seah, M.P.: The quantitative analysis of surface by XPS - A review, *Surface and Interface Analysis*, Dec.1980, Vol.2, No.6, pp.222-239.

[27] Wagner, C.D., Davis, L.E., Zeller, M.V., Taylor, J.A., Raymond, R.H., and Gale, L.H.: Empirical atomic sensitivity factors for quantitative analysis by electron spectroscopy for chemical analysis by electron spectroscopy for chemical analysis, *Surface and Interface Analysis*, Oct.1981, Vol.13, No.5, pp.211-225.

[28] Davis, L.E., Macdonald, N.C., Palmberg, P.W., Riach, G.E., and Weber, R.E.: *Handbook of Auger Electron Spectroscopy*, 1st edition, Physical Electronics Inc., Minnesota, 1972.

[29] Sekine, T., Nagasawa, Y., Kudo, M., Sakai, Y., Parkes, A.S., Geller, J.D., Mogami, A., and Hirata, K.: *Handbook of Auger Electron Spectroscopy*, 1st edition, JEOL Ltd., Tokyo, 1982.

[30] Wagner, C.D., Riggs, W.M., Davis, L.E., and Moulder, J.F.: *Handbook of X-ray Photoelectron Spectroscopy—A Reference Book of Standard Data for Use in X-ray Photoelectron Spectroscopy*, Perkin-Elmer Corp., Physical Electronics Division, Minnesota, 1979.

[31] Moulder, J.F., Stickle, W.F., Sobol, P.E., and Bomben, K.D.: *Handbook of X-ray Photoelectron Spectroscopy*, Perkin-Elmer Corp., Physical electronics Inc., Minnesota, 1992.

[32] Ikeo, N., Iijima, Y., Nimura, N., Shigematsu, M., Tazawa, T., Matsumoto, S., Kojima, K., and Nagasawa, Y.: *Handbook of X-ray Photoelectron Spectroscopy*, JEOL Ltd., Tokyo, 1991.

前 言

本标准按照 GB/T 1.1—2009 给出的规则起草。

本标准采用翻译法等同采用 ISO 18118:2004《表面化学分析 俄歇电子能谱和 X 射线光电子能谱实验测定的相对灵敏度因子在均匀材料定量分析中的使用指南》。

与本标准中规范性引用的国际文件有一致性对应关系的我国文件如下：

——GB/T 22461—2008 表面化学分析 词汇(ISO 18115:2001, IDT)；

——GB/T 21006—2007 表面化学分析 X 射线光电子能谱仪和俄歇电子能谱仪 强度标线性(ISO 21270:2004, IDT)。

本标准由全国微束分析标准化技术委员会(SAC/TC 38)提出并归口。

本标准负责起草单位：北京师范大学分析测试中心。

本标准主要起草人：吴正龙。