

supplement 1, pp235–238(2002).

- 13) Zimmer AT, Maynard AD: Investigation of the aerosols produced by a high-speed, hand-held grinder using various substrates. *Ann Occup Hyg* 46, 663–672(2002).
- 14) Brouwer DH, Gijsbers JH, Lurvink MW: Personal exposure to ultrafine particles in the workplace: Exploring sampling techniques and strategies. *Ann Occup Hyg*, 48, 439–453 (2004).
- 15) Peters TM, Heitbrink WA, Evans DE, Slavin TJ, Maynard AD: The mapping of fine and ultrafine particle concentrations in an engine machining and assembly facility. *Ann. Occup. Hyg.* 50, 249– 257(2006)
- 16) Thomassen Y, Koch W, Dunkhorst W, Ellingsen DG, Skaugset NP, Jordbekken L, Drablosd PA, Weinbruche S : Ultrafine particles at workplaces of a primary aluminium smelter. *J Environ Monit*, 8, 127– 133(2006).
- 17) Maynard AD, Baron PA, Foley M, Shvedova AA, Kisin ER, Castranova V: Exposure to carbon nanotube material: Aerosol release during the handling of unrefined single-walled carbon nanotube material. *J Toxicology Environ Health-Part A* 67:87–107 (2004)
- 18) Kuhlbusch TAJ, Neumann S, Fissan H: Number size distribuiton, mass concentration, and particle composition of PM1, PM2.5, and PM10 in bag filling areas of carbon black production. *J. Occup Environ Hyg*, 1, 660–671(2004).
- 19) Kuhlbusch TAJ., Fissan H: Particle characteristics in the reactor and palletizing areas of carbon black production. *J Occup Environ Hyg*, 3, 558–567(2006).
- 20) Methner M M, Birch ME, Evans DE, Ku BK, Crouch K, Hoover MD: Identification and characterization of potential sources of worker exposure to carbon nanofibers during polymer composite laboratory operations. *J Occup Environ Hyg*, 4, D125– D130 (2007)

21) Fujitani Y, Kobayashi T, Arashidani K, Kunyigita N, Suemura K: Measurement of the Physical Properties of Aerosols in a Fullerene Factory for Inhalation Exposure Assessment. *J Occup Environ Hyg*, 5:380-389(2008)

図 1 吸入性粉じん用パーソナルサンプラーの例

図 2 光散乱方式相対濃度計の例

図 3 光散乱式相対濃度計の特性 (試験粒子は塩化ナトリウム)

図 4 表面積濃度の測定装置と簡単な原理図

粒子の帯電量を混合部の下流で計測する。

図 5 個数濃度測定装置

O P C と C P C の例

図 6 電気移動度分級装置(DMA)の構造と S M P S の例

図 7 インパクタの原理

図 8 電気量式減圧インパクタ(ELPI)の構成

図 9 二酸化チタンナノ粒子のSEM写真

(a) BET比表面積 65 m^2/g (b) BET比表面積 20 m^2/g

図 10 ナノ粒子の曝露評価の手法と目的

図1吸入性粉じん用パーソナルサンプラー(PM4)の例

