

SEMI P14-0997

DETERMINATION OF TIN IN POSITIVE PHOTORESISTS BY GRAPHITE FURNACE ATOMIC ABSORPTION SPECTROSCOPY

This Standard was technically approved by the Micropatterning Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee.

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1 Scope

1.1 This procedure is a graphite furnace atomic absorption analytical method for tin in photoresist. The applicable concentration range is 0.1 to 1 ppm when the sample is diluted one to ten. The precision was found to be within 0.1 ppm in a round robin analysis between four laboratories.

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2 Instrument Conditions

2.1 An atomic absorption spectrometer equipped with a graphite furnace is used with graphite tubes equipped with pyrolytically coated graphite platforms for sampling.

2.2 The 224.6 nm emission line from a hollow cathode tin lamp is used as the analytical absorption line.

Table 1 Furnace Program^{#1}

	<i>Dry Step</i>	<i>Char Step</i>	<i>Atomization Step</i>
Temperature (°C)	110	800	2700
Ramp time (s)	20	20	0 ^{#2}
Hold time (s)	20	20	5

#1 Argon flow rate of 50 mL/min.

#2 Maximum power heating.

3 Sample Preparation

3.1 The sample is diluted 1/10 (1 part sample + 9 parts solvents weight/weight) in 2-methoxyethanol or another suitable solvent for positive resist. The solvent should contain less than 0.01 ppm of tin.

4 Standards

4.1 The standards should be weight/weight (mg/kg) and should be diluted weight/weight since results will be expressed in mg/kg.

4.2 A 50 ppm tin standard is prepared by diluting a 500 ppm tin standard in oil to 50 ppm with xylene.

4.3 A 1 ppm standard is made by diluting the 50 ppm standard in 2-methoxyethanol or another suitable solvent.

5 Procedure

5.1 A 20 µL volume of 1 ppm tin standard is transferred to the platform by Eppendorf pipette. The furnace program is run and absorbance measured. The absorbance of the 1 ppm tin standard should be in the range of 0.2 absorbance. Measure the absorbance of the solvent and sample in an identical manner.

6 Calculation

$$\text{ppm tin (mg/kg)} = \frac{\text{Abs. Sample} \times \text{ppm Standard} \times \text{dilution factor}}{\text{Abs. Standard}}$$

6.1 *Detection Limit* — The detection limit is a function of the dilution factor and can vary by instrument. The solution factor should be taken into account in calculation of the detection limit.

6.1.1 Detection limit (ppm) = $s \times \text{dilution factor}$ where s = standard deviation of instrument reading in PPM.

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