Analysis of Next Generation Precursor Compounds by ICPMS

Phil Clancy and Scott Anderson

Air Liquide-Balazs Analytical Services

Abstract

New materials coming into use in CVD (chemical vapor deposition) and ALD (atomic layer deposition) processes offer unique challenges for the chemical supplier and analytical laboratory. Examples of these compounds include TDEAH (tetrakis(diethylamino)hafnium), TEMAH (tetrakis(ethylmethylamino)hafnium), TDMAH (tetrakis(dimethylamino)hafnium), and similar compounds based on silicon, zirconium, and titanium. The relatively high concentration of contaminant metals in the initially prepared materials necessitates considerable purification and analyses to confirm that the contaminants have been successfully removed.

In this paper, we discuss the problems associated with the analysis of trace metals in these new materials. Potential pitfalls include volatile elements that can easily be lost in sample preparation and distort the reported concentrations in the material. This is important as the volatile impurities will be codeposited in CVD or ALD processes, and will contaminate the final processed film on the wafer. A separate issue, detection limits must be calculated carefully as the routine statistical calculations do not take into account the ability to spike and recover at reporting levels. Finally, mass interferences and space charge effects in the ICPMS will also be discussed as these problems can easily be magnified with these high mass compounds.