Measurement of Vapor Pressure of Selected Organometallic Precursors by a Static Method

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Vapor pressure of organometallic precursors plays an important role for establishing optimal conditions of the metal organic vapor phase epitaxy (MOVPE) process. Vapor pressure of most precursors falls into low pressure region (pressure below 1 kPa), where measurements are often subject to large systematic errors. Moreover, many of precursors are pyrophoric, some of them are also toxic. High-purity samples were not available in past and became available in the last decade only. As a consequence, experimental vapor pressure data for these compounds either show significant scatter or are missing at all. New static apparatus STAT5 equipped with an MKS Baratron 616A 12TRC differential pressure gauge is described. This apparatus enables measurement of vapor pressure of MOVPE precursors, including highly toxic compounds of As and P. Pressures from 1 Pa to 13 kPa in the temperature range from (253 to 323) K can be measured with an uncertainty of about 1 % or 0.1 Pa (whichever is greater). Handling of metal organic precursors prior to vapor pressure measurement and first results obtained with STAT5 are presented along with overview of results for precursors of Ga, Sb, Zn, In, Si, Al, Y and Zr, obtained with previous versions of apparatuses, STAT3 and STAT4, operating in temperature ranges from (313 to 473) K and (233 to 313) K, respectively. Main sources of systematic errors influencing measurements (degassing, adsorption, thermal transpiration) are discussed.

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