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Detection of Lithium traces in microelectronics materials: a preliminary study

Vincent Thoréton, Delphine Truffier-Boutry, Jean-Paul Barnes

Univ. Grenoble Alpes, CEA, Leti, F-38000 Grenoble, France

*Contact: Vincent.thoreton@cea.fr

Abstract

Lithium-based materials, whether thin layers or bulk material, are of great interest for varied applications (batteries, RF components...). However, their cohabitation with other “standard” materials for microelectronics requires special attention. As a precaution, these materials are “confined” on dedicated manufacturing lines, without full knowledge of their potential effect on the manufactured devices. One step on the way to studying the potential impact on electrical performances on devices is to be able to detect and follow traces of Lithium.

Many studies on Lithium exist, most of them concerning energy storage materials involving high Lithium concentration. In such context, specific precautions and methodologies were implemented. These must be defined in the frame of studies related to microelectronics taking into account lower Lithium concentrations. We initiated methodology development in order to identify and quantify Lithium in various materials and at their interfaces using sensitive mass spectrometry (MS) technics such as secondary ion MS (SIMS), time of flight SIMS (ToF-SIMS) or vapour phase decomposition inductively coupled plasma MS (VPD-ICPMS). This implementation will allow studying more into depth the mechanisms and kinetics of lithium diffusion as well as evaluating its impact on the performance of “microelectronics” devices.

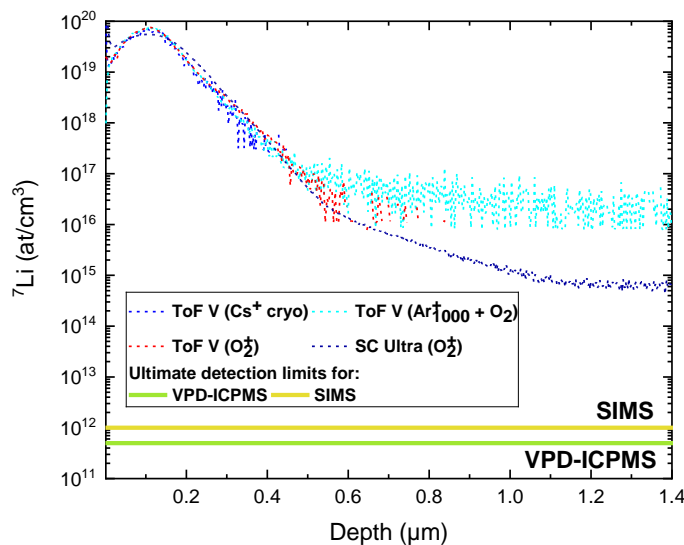


Figure 1: comparison of SIMS measurements on a Lithium implanted silicon sample with various experimental conditions. Theoretical detection limits are indicated for SIMS and VPD-ICPMS (plain lines).

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