

Report on the outcomes of a Short-Term Scientific Mission¹

Action number: CA10129

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Details of the STSM

Title: Electron induced reactions in EUVL photoresists: methyl acetate and neopentyl tris(pyruvate) tin(IV)

Start and end date: 18/08/2025 to 29/08/2025

Description of the work carried out during the STSM

This STSM enabled the structuring of experimental results on methyl acetate and neopentyl tris(pyruvate) tin(IV). For methyl acetate, appearance energies were determined by analyzing electron energy profiles of the most intense fragments. These included the parent cation as well as fragments with m/z values of 59, 43, 42, 31, 29, and 15, corresponding to CH_3CO_2^+ , COCH_3^+ , COCH_2^+ , CH_3O^+ , CHO^+ , and CH_3^+ , respectively. The obtained thresholds were compared with B3LYP quantum chemical calculations, showing good agreement between experiment and theory.

For neopentyl tris(pyruvate) tin(IV), analysis of dissociative electron attachment (DEA) studies were carried out. Negative ion formation in the energy range of 0–15 eV revealed three anions with m/z values of 421, 355, and 101. After detailed analysis and discussion, these ions were assigned as $\text{SnC}_{15}\text{H}_{25}\text{O}_6^-$, $\text{SnC}_{10}\text{H}_{19}\text{O}_6^-$ (consistent with isotopic distribution), and $\text{C}_5\text{O}_2\text{H}_9^-$, respectively. Formation of the heaviest ion (m/z 421) involves an increase in the Sn coordination number from IV to V. The lighter fragment (m/z 101) originates from a single O–S bond cleavage.

Description of the STSM main achievements and planned follow-up activities

The proposed goals for the mission have been successfully achieved. A scientific article on the dissociative ionization of methyl acetate has been prepared and is expected to be ready next week for circulation among co-authors, with submission to *The Journal of Chemical Physics* planned within the coming weeks. For neopentyl tris(pyruvate) tin(IV), the introduction has been written and calculations are in progress. The first complete draft is expected by mid-September.

In addition to the specific scientific objectives, meetings were held to discuss future plans. These included outlining a potential European-level application, as well as additional publications within the framework of the collaborative program between Nova University, the University of Iceland, and IMEC in Belgium.

¹ This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

A scientific article on dissociative ionization to complementary/different tin compounds will be prepared and submitted by the end of the year.