**Introduction**

Non-metallic inclusions such as Al₂O₃, MgAl₂O₄ and Al₆C₃ are the most undesired impurities in Al-melts as they invariably cause a decrease of mechanical property and surface quality of the products. To remove those inclusions more efficiently and economically, a reliable quantitative inclusion analysis method and an in-depth understanding of inclusions behaviour are prerequisites. Starting in 2013, Project 4 focused mainly on the research of inclusion quantification techniques and particle behaviour in Al-melts. Three main work packages namely Ultrasound (US), Laser Induced Breakdown Spectroscopy (LiBS) and Particle Behaviour were proposed and executed within the project.

**Timeline of P4**

**Ultrasound**

The goal of US Work Package was to develop a laboratory prototype capable of monitoring melt quality. Through ultrasound field tests, key components and operational parameters of the prototype for a high particle detection sensitivity, signal strength and corrosion resistance were determined.

**LiBS**

The goal of LiBS Work Package was to assess the feasibility of applying Laser Induced Breakdown Spectroscopy method on molten metal inclusion detection. Through lab-scale tests sensitivity of LiBS to certain inclusions in Al-melts was validated. Afterwards a wrought alloy test was done, during which robustness of the LiBS prototype was proven.

**Particle Behaviour**

The goal of Particle Behaviour Work Package was to improve know-how in settling and agglomeration tendencies of inclusions in Al-melts. A setup was built and validated which allowed the monitoring of inclusions through a LiMCA unit in settling trials. A basic mathematical model was established to understand the terminal settling velocities of particles with different chemistries. Meanwhile lab-scale experiments demonstrated the relation of agglomeration tendency and wettability of inclusions.

**Continuation of P4**

Industry partners of P4, FOSECO and MAGMA, will proceed to support the Particle Behaviour research of P4, denoted P4C, in order to enhance the fundamental know-how of inclusion agglomeration. Two following tasks have been jointly decided to be the main research areas in P4C:

- Agglomeration study with both unique type and different types of inclusions in 5000 Al-melt;
- Inclusion removal experiments (sedimentation and flotation) based on understanding and utilization of agglomeration.

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