Executive Summary
Rolled aluminum products tend to have lower final thicknesses and increasing demands on surface quality. Trends of lightweight cast components also lead to thinner wall thicknesses and more complex geometries. At the same time mechanical and thermal stresses rise. The increasing demands can only be met through continuous development of materials and highest quality products. Materials which have a low impurity content compared to contaminated and have defect-free and homogeneous surfaces have significantly better mechanical properties and show even under dynamic loading a longer lifetime and improved fatigue strength. Inclusions such as aluminum carbide Al₄C₃, alumina Al₂O₃, titanium boride TiB₂, magnesium oxide MgO and spinel MgAl₂O₄ are in this regard the most common types of undesirable impurities in aluminum melts.

To meet the high requirements of the product and material properties reliably, it is imperative to characterize the melt in terms of their impurities and assign a defined purity. Accordingly the appropriate melt purification and treatment process parameters have to be derived. Measurement systems are currently available like LiMCA, PoDFA and MetalVision, but these are not very practical, fast, accurate and mostly not reliable for continuous quality control in production.

Scope
The melt cleanliness has been improved in the last decades by the development of melt treatment and filtration technologies. However there are still improvements expected in the following areas:

- Formation mechanisms of critical inclusions
- Evolution of inclusions from their formation to the solidified product
- Quantification of inclusions in the melt
- Impact of inclusions on the properties of the final product

Within the first 3 years of the project the consortium will focus on the development of the quantification of inclusions in the melt and its relation to the specific inclusion. Within the project several approaches regarding the measurement method will be developed and evaluated.

Timeline

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