Study of macrosegregations and their control through new cooling processes for INGots of key Alloys for the transition to clean energy – DELINEA.

PROJECT DESCRIPTION - ZL-2025/00929

Decarbonization is Europe's main goal for **2050**. There are several sectors considered key to achieving these objectives, as they are the largest **generators of CO_2 emissions**. In the case of **energy-related industry**, this goal can only be met through the development of **new renewable energy sources** capable of addressing new challenges in power generation and whose service life makes them **sustainable over time**.

Renewable energy that includes **biofuel generation**, the use of energy contained in **residual energy sources**, and that generated by **waste combustion** represents one of the main sources of renewable energy in Europe. These types of renewable energies require **alloys with high corrosion resistance** and **significant mechanical properties at high temperatures** to enhance their development and long-term durability, making their operating costs manageable.

Superalloys are alloys well known in the **aerospace field** for their superior **mechanical properties** in terms of **tensile strength** and **corrosion resistance** at high temperatures. These superalloys also exhibit very specific capabilities against **stress corrosion**. However, their properties depend on how the **manufacturing process** has been carried out, as the presence of **segregations** and undesirable phases can result in the **total or partial loss** of their resistance to **stress corrosion**, reducing their **service life**.

The **DELINEA** project aims to **research the solidification mechanisms** of **key alloys** for the **transition to clean energy**, in order to adapt them through the development of a **new ingot cooling process** that reduces **macrosegregation formation** during the ingot manufacturing process and guides solidification, thereby increasing **metal yield** and the alloy's properties of **corrosion resistance**, **stress corrosion resistance**, and **mechanical strength**.

During the project, both **modeling** and **experimental studies** of the segregation phenomena occurring in the selected alloy (**IN625**) are being carried out, along with the **design and fabrication of cooling systems** at **pilot plant scale**, and the **production of ingots** using these cooling mechanisms in the pilot plant. The project will conclude with a **technical, economic, and environmental conceptualization** of the **scaling process**.

Within the project, **TXINN** is in charge of studying the **segregations** occurring in the selected alloy, both **before and after** the development of the optimized cooling process, in order to evaluate its effect on **macrosegregation formation**. **TXINN** will also support **Acería de Álava** in the **conceptualization of the scale-up process**.

CONSORTIUM

Coordinator:

- ACERÍA DE ÁLAVA S.A.

Agents of the Basque Network of Science, Technology and Innovation (RVCTI):

- FUNDACIÓN AZTERLAN
- TUBACEX INNOVACIÓN

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