

## The Development and Application of Aluminum Alloys in Nuclear Industry

**M.Husna Al Hasa**

Research Center for Nuclear Fuel and Radioactive Waste Technology, Universitas Indonesia, Jawa Barat 16424, Indonesia

**Wisnu Ari Adi**

The National Research And Innovation Agency (Badan Riset dan Inovasi Nasional), Indonesia

**Dede Djuhana**

The National Research And Innovation Agency (Badan Riset dan Inovasi Nasional), Indonesia

**Djati Handoko**

The National Research And Innovation Agency (Badan Riset dan Inovasi Nasional), Indonesia

**Masrukan**

The National Research And Innovation Agency (Badan Riset dan Inovasi Nasional), Indonesia

**Kemal Maulana Alhasa**

The National Research And Innovation Agency (Badan Riset dan Inovasi Nasional), Indonesia

### Abstract

The necessity for lightweight components in the nuclear sector is driven by the requirement to minimize the total weight of the fuel. Aluminum alloys have emerged as the primary choice for incorporation into the nuclear fuel structure of research reactors, primarily serving as a cladding material for the containment of uranium fuel. Their utilization is driven by their ability to fulfill the prerequisite of having a lower relative density than other metals, thereby contributing to a reduction in the total weight of the fuel. Furthermore, they demonstrate superior mechanical properties, thermal characteristics, and corrosion resistance. Examples such as AlFeNi and Al 6061 (AlMgSi) aluminum alloys showcase commendable mechanical attributes, thermal behaviour, and stability, being amenable to strengthening through specific heat treatments, consequently demonstrating favourable performance as cladding materials in nuclear applications and thereby extending the lifespan of the fuel. Additionally, they possess notable recyclability. This article presents a comprehensive survey of various aluminum alloys utilized in the nuclear industry, detailing their production methods, and elucidating their influence on mechanical properties, thermal behaviour, and stability, focusing on recent research findings. Furthermore, this review outlines existing challenges and offers a comprehensive roadmap for prospective research.

### Keywords

Development, Aluminum alloy, cladding, nuclear materials.

