A portrait of aluminium, metal of dream and modernity

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Abstract

Beyond its technical and commercial aspects, aluminium can be regarded from a cultural viewpoint as a metal of dream and modernity. Contrary to other ordinary metals, which were known in very ancient times, aluminium was just a dream of the chemists before it was discovered in the midst of the nineteenth century. As it was produced by way of a very costly chemical process, it was considered at first as a semi-precious metal and mainly used in jewellery. Then, with the electrolytic process, the production cost was drastically decreased and aluminium became an ordinary metal. But during World War I, it was still a matter of dream and modernity - the dream in the trenches, where the soldiers used to collect aluminium parts of shells to make various objects, such as rings for their beloved wives - and the modernity with the first aluminium military airplanes. At that time aluminium was a metal of dread as well as a metal of dream and love. Aluminium shaped the twentieth century with its modern applications in transportation, construction and households. But it remains a metal of dream with iconic creations as the Paco Rabanne's dress, the Stark's Juicy Salif or the comet lander Philae.

Keywords: Aluminium history ; aluminium applications.

1. Foreword

After having worked for 30 years in the aluminium group of Pechiney as production superintendent, plant manager, vice-president technology and overseas operations, and finally executive vice-president of the aluminium group, CEO of Aluminium Pechiney, I retired twenty years ago, and I was elected president of the Institute for the History of Aluminium (IHA), a non-profit organisation for the development of historical research on aluminium production, fabrication and applications, the preservation and promotion of heritage through collections, exhibitions and museums, as well as publications (journal, books and website) on an international scale. That is why I want to present you a vision of aluminium beyond its usual technical and commercial aspects. Curiously it was and still can be regarded as a metal of dream and also "the material of a streamlined aesthetic that came to represent modernity." [1]

2. Dreaming about a new metal (1754 - 1854)

As any beautiful story, the one of aluminium begins with a legend. 50 years before Christ, Pliny the Ancient tells, in his *Historia Naturalis*, a goldsmith in Rome was able to present the emperor Tiberius with a tray made of a new metal, very light and almost shiny as silver. The goldsmith explained to the emperor he extracted this metal from raw clay. He also assured him that only the gods and himself knew how to do it. The emperor appeared very interested, but also worried due to the fact that all his gold and silver treasures could, one day, loose their value if it would be simply possible to get this shiny metal from clay. Therefore, instead of congratulating the goldsmith, he had him right away beheaded. Although it would be theoretically possible to produce aluminium from clay, as Pechiney and Alcan proved it in the seventies with the H+ process, it would imply the implementation of chemical processes surely unknown in the Roman era. It took a long time until the nineteenth century to be able to see aluminium.

2.1. The precursors

The alum, which refers to various double sulphates of aluminium and an alkaline metal - the word itself being derived from the Latin word alumen - was the first aluminium ore to be used. For long it was considered as a simple and not dissociable body. It was known as a medicine in China in the thirty sixth century BC, and in Egypt, according to the Ebers papyrus, in the sixteenth century BC. Pliny the Ancient also dedicated an article describing 39 medical uses due to its astringent feature. But its most important use as "mordant" remains related to its ability to fix the dyestuffs and make them insoluble. In his work De natura fossilium published in 1546, the German mineralogist Georg Bauer, known as Agricola, made an inventory of the alum mines, the most important of them was La Tolfa, northwest from Rome. Ten years later, in his De re metallica, he described the mining processes to get alum from the alumiferous earths.

In 1754, the German chemist Sigismund Marggraf (1709-1782) managed to decompose alum by calcination. He isolated the *pure clay* or the *earth of alum*, which is nothing else than alumina, the aluminium oxide. In turn, this one was initially considered as a simple body. Théodore Baron, a French physician, was the first one who asserted to be convinced the earth of alum hid a metal. In 1760, he tried in vain to decompose it, but he wrote: "*I think it not too adventurous to predict a day will come when the metallic nature of the base of alum will be incontestably proven."* [2] Thus he was on that way the Lavoisier's precursor, this one having put forward, in 1787, the more general assumption that earths could not be only simple bodies. With Robert Guyton de Morveau (1737 - 1816), a French magistrate and chemist, he renewed the chemical nomenclature of that time, and the *alum earth* became *alumina.*

In 1807, the British chemist and physicist Humphrey Davy (1778 - 1829), using the Volta battery, succeeded in isolating sodium and potassium, but alumina was resistant to this processing. He wrote: *"Had I been fortunate enough to isolate the metal after which I sought, I would have given it the name alumium."* [3]. This name is derived from alumen (alum). But the new metals being rather denominated from their oxide, it became, a few years later, *aluminium*, from alumina*,* instead of alumium.

The Danish physicist and chemist Hans Christian Oersted (1777 - 1851) thought of using the aluminium chloride as a medium. In 1825, he made its synthesis by reaction of chlorine with a mixture of alumina and coal. Then he tried to reduce it with an amalgam of potassium. After calcination, he obtained a powder containing perhaps some aluminium, but with too many impurities so that he was unable to determine its properties.

These experiments were repeated in 1827 by a German chemist, Friedrich Wöhler (1800-1881) who replaced the potassium amalgam by pure potassium and so obtained "*a grey powder which, closely examined, seems made of small metallic flakes. It is aluminium*." [4]. But this aluminium was mixed with some impurities and especially potassium, which wrongly gave it the property to be attacked by using boiling water. In 1845 he obtained some bigger particles, which allowed him to determine its density, but they were still impure and attacked by boiling water.

2.2. The Sainte-Claire Deville process

It would be deeply exciting for us to share our know-how, to broaden our collections and network with all the aluminium people, companies, organizations. Heritage may reveal itself as a major part of our present and future identity.

"Yet aluminum cannot help but embody the optimism that accompanies a reorientation toward a better, cleaner, simpler world. It is the material that best expresses nostalgia for the future."[12.]

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8. References

1. Mimi Sheller, Aluminium dreams. The making of light modernity. The MIT Press, 2014.
2. Théodore Baron. Mémoires de l'Académie royale. Paris, April 16, 1760, p.274.
3. Joseph W. Richards. ALUMINIUM: its history, occurrence, properties, metallurgy and applications, including its alloys. Henry Carey Baird, Philadelphia. 1896, p. 5.
4. Friedrich Wöhler. Poggendorff's Annalen. 11, 1827, p. 146-161.
5. Henri Sainte-Claire Deville. Aluminium, its properties, manufacture and applications. Mallet-Bachelier, Paris, 1859, preface.
6. Guillaume Apollinaire. Lettre à Fernand Divoire. 3 May 1915.
7. Guillaume Apollinaire. Lettre à Mireille Havet. 5 July 1915, in Tendre comme le souvenir, Gallimard, 1952.
8. Guillaume Apollinaire. Lettres à Lou. L'Imaginaire – Gallimard.
9. Guillaume Apollinaire. Lettre à Madelaine Pagès. 11 August 1915, in Calligrammes, Mercure de France, 1918.
10. Ivan Grinberg. Aluminium. Light at heart. Découvertes Gallimard, Paris, 2003, p.82, 84.
11. Sarah Nichols, Aluminum by design. Carnegie Museum of Art, 2000. Paco Rabanne's quotation. p.252.
12. Paola Antonelli. Aluminum and the new Materialism, in Aluminum by design, p.188.

As far as Guillaume Apollinaire's letters are concerned (6, 7, 8, 9) their translation comes from the book *Aluminium passion. The treasure-trove of the Collection Jean Plateau-IHA,* Les Edition du Mécène. Paris. 2013.