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Aluminium History

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Aluminium was one of the newest metals to be discovered by humans. Aluminium does not occur naturally in its purest form so it was not discovered until the 19th century with developments in chemistry and the advent of electricity. Aluminium has gone on an incredibly interesting journey from a precious metal to the material used virtually in every sphere of human life in just one and a half centuries.

Aluminium is a chemical element (Al), a lightweight, silvery-white metal of main Group IIIa, of the Periodic table. Aluminium is the most abundant metallic element in the Earth's crust and the most widely used nonferrous metal [1].

Alum, an aluminium-based salt, was used extensively in ancient times. Commander Archelaus discovered that wood was practically flame resistant if it was treated using an alum solution; protecting his wooden fortifications against flamed attack. Alum was used throughout Europe from the XVI century onwards: in the leather industry as a tanning agent, in the paper-pulp industry for paper sizing and in medicine, i.e. dermatology, cosmetology, stomatology and ophthalmology.

Aluminium was named after alum, which is called 'alumen' in Latin. This name was given by Humphry Davy, an English chemist, who, in 1808, discovered that aluminium could be produced by electrolytic reduction from alumina (aluminium oxide), but did not manage to prove the theory in practice.

Hans Christian Oersted from Denmark was successful in 1825; however he apparently produced an aluminium alloy with the elements used in the experiments, rather than pure aluminium. The produced metal resembled silver, it was light and expensive, hence at that time aluminium was considered an elite material intended for ornaments and luxury items. The first aluminium products are considered to be medals made during Napoleon III's reign. Napoleon supported the development of aluminium production. However, even then it was understood that the future of aluminium was not just to be associated with jewellery: aluminium's development changed with the discovery of a more cost-efficient electrolytic production method in 1886. It was developed by Paul Héroult, a French engineer, and Charles Hall, an American student, independently and at the same time. The process demonstrated excellent results, but required an enormous amount of electric power. Héroult avoided this problem by harnessing the power of the Rhenish Falls in Neuhausen (Switzerland) where the force of the falling water bought the smelters dynamos into operation [2].

Karl Joseph Bayer, an Austrian chemist, invented a cheap and feasible alumina (aluminium oxide) production method in 1889. Going forward, Alumina became the basic raw material for aluminium production.

Aluminium production processes used today are based on the Bayer and Hall-Héroult processes.

The aluminium industry was created over several decades. The story of the 'clay silver' came to an end and aluminium became a new industrial metal.

Aluminium began to be used in various ways at the turn of the XIX and XX centuries which created an incentive for development in a new range of industries.

Alfred Nobel ordered the creation of Le Migron, the first passenger boat to use an aluminium hull, in Switzerland, 1891.

Three years later the Scottish shipbuilding yard Yarrow & Co created a 58 metre torpedo boat made of aluminium named Sokol. Sokol was made for the Russian Empire's Navy and accelerated to a speed of 32 knots, a record speed for the time.

In 1894 in New Haven, New York, Hartford Railroad, the American rail company then owned by banker John Pierpont Morgan (J.P. Morgan), started to produce special lightweight passenger railroad cars with aluminium seats. Just 5 years later, Karl Benz presented the first sports car with an aluminium body at an exhibition in Berlin.

Still, aluminium used for aviation was the real revolution, which is where the name 'winged metal' was born. Inventors and aviators around the world work towards the development of controlled aerial vehicles during this period.

Duralumin, a key aluminium alloy, was invented in 1909. It took seven years for Alfred Wilm, a German scientist, to create it, but it was worth the years of effort. Duralumin, with addition of copper, magnesium and manganese was as lightweight, as aluminium, but significantly exceeded it in strength, hardness and elasticity meaning it quickly became the main material used in aviation.

Meanwhile, aluminium gained uses elsewhere. Aluminium began to be used for the mass production of houseware that quickly and almost completely replaced copper and cast iron utensils. Aluminium frying pans and saucepans are light, warm and cool quickly and do not rust.

Another critical moment for the aluminium industry began in 1920, when a group of scientists under the leadership of Soderberg from Norway invented a new aluminium production process that made the Hall- Héroult method much cheaper. Previously, pre-baked coal blocks were used as anode cells during reduction; they were consumed quickly and so the use of new ones was required constantly. Soderberg solved this problem with the help of a continuous electrode. It is formed in

a special reduction chamber from a coke and tar paste and added to the upper hole of the electrolyte cell when required.

Aluminium was widely used in the aviation, shipbuilding and automotive industries during that time and started its progress in civil engineering. The Empire State Building, which was the highest building worldwide until 1970, was built in 1931. It was the first building where aluminium was widely employed in construction, both in the basic structures and in the interior [2].

The human race took a leap into space in the middle of the XX century. The use of aluminium was critical and therefore triggered the aerospace industry to become one of the key spheres. In 1957, the USSR launched the first artificial satellite into orbit. The satellite's hull consisted of two separate aluminium semi-spheres joined together. All subsequent space vehicles were produced using aluminium.

The aluminium can, an iconic product that became one of the largest aluminium commodities, the symbol of environmental friendliness and a focal point in the field of art and design, emerged in the USA in 1958. The can's invention was shared between Kaiser Aluminium and Coors. Coors was not only the first company to sell beer in aluminium cans but also organised the collection of empty cans using a recycling system. Coca-Cola and Pepsi started to sell their drinks in aluminium cans in 1967.

References:

1. Mode of access:

http://www.aluminiumleader.com/history/industry_history/. –
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2. Galevsky G., Makarycheva E. English for Students of Metallurgy / G. Galevsky, E. Makarycheva. – Moscow. – 2004. – P. 59.