LIGHT METALS

Light metals are metals or alloys that have a low density and a high strength-to-weight ratio. They are widely used in engineering applications for land, sea, air, and space transportation. Some examples of light metals are magnesium, aluminium, and titanium

- Definition: The metals commonly classed as light metals are those whose density is less than the density of steel (7.8 g/cm 3, or 0.28 lb/in. 3). Since these pure metals are usually softer materials with insufficient strength, they must be alloyed to reach target mechanical properties
- Characteristics: Light metals and their alloys have relatively low density and high strength-to-weight ratios. They also have different properties such as corrosion resistance, heat resistance, electrical conductivity, and ductility, depending on the type and composition of the alloy[1].
- Trends: Light metals and their alloys are the prime material of construction for the aircraft industry throughout most of its history. They are also used widely in aerospace, automotive, architectural, lithographic, packaging, electrical and electronic applications. In some cases, these light alloys may be replaced by composite materials especially those made from glass fibers, carbon fibers, and Kevlar. These composite materials are strong, but can weigh half as much as aluminium. These lightweight, customizable materials are becoming more popular[1].

Magnesium, aluminium and titanium are light metals of significant commercial importance. These three metals and their alloys comprise the bulk of the high strength-to-weight ratio metallic materials used in industrial systems. Aluminium is the most versatile of these materials and titanium is the most corrosion resistant with very high strength, while magnesium has the lowest density. Their densities of 1.7 (magnesium), 2.7 (aluminium) and 4.5 g/cm3 (titanium) range from 19 to 56% of the densities of the older structural metals, iron (7.9g/cm3) and copper (8.9 g/cm3). The metals commonly classed as light metals are those whose density is less than the density of steel (7.8 g/cm3, or 0.28 lb/in.3).

Typical composition of 6061 aluminium alloy

Material	Al	Copper	Magnesium	Manganese	Silicon	Chromium
Alloy 6061	97.7%	0.25%	1%	0.15%	0.60%	0.20%

Typical composition of magnesium alloy Elektron 21

Material	Magnesium	Neodymium	Zinc	Gadolinium	Zirconium	Other
Elektron 21	Bal.	3%	0.2-0.5%	1.5%	saturated	-

Typical composition of Ti-6Al-4V – Grade 5 Titanium Alloy

Material	Titanium	Aluminium	Vanadium	Iron	Oxygen	Hydrogen
Grade 5	Bal.	6%	4%	<0.25%	<0.2%	<0.015%

The use of lightweight materials like aluminium in an automobile by replacing cast iron and traditional steel components helps OEMs reduce vehicle weight, fuel consumption, and greenhouse gas emissions.

As environmental legislation globally turns stringent, lightweighting metal is a crucial element that will enable original equipment manufacturers (OEMs) in the automotive sector to continue and meet emission targets. The desire to have lighter cars directly results in weight and fuel consumption, improving mileage and reducing CO2 emissions.

When we talk of fuel economy improvement, a 10 percent reduction in vehicle weight can lead to a 6-8 percent benefit. The use of lightweight materials like aluminium in an automobile by replacing cast iron and traditional steel components perfectly meets the requirements of reducing weight, fuel consumption, and greenhouse gas emissions.