# THE ROLE OF COMPOSITE MATERIALS IN SCIENCE

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## Introduction

The development of modern technologies creates new materials with high mechanical performance compared to traditional materials, demand for elasticity and other new features. Composite materials based on polymers, ceramics and metals are among the most interesting and promising products. Polymer, ceramic, metal matrix composite materials are used more in engineering, and they are used in the absence of new technology or other materials that respond to production.

Nowadays, we encounter composite materials every day, not only in technology, but also in daily practice, so it is important to know the main properties of these materials and use them correctly. Composite materials are the main class of materials that meet strict, often contradictory requirements, for example, they are used for the production of products resistant to high temperatures, mechanical forces and aggressive chemical environments. Composites can effectively compete with construction materials such as aluminum, titanium, and steel. Industries that actively use composite materials include aviation, cosmonautics, marine transport, chemical engineering, medicine, sports, tourism, and mechanical engineering [1].

Figure.1. The origin of composite materials

## Materials and Methods

***Composite materials*** are complex systems made up of components with different properties, which consist of a mixture of elastic and hard phases that provide integrity and strength. In this case, each separate component cannot fully meet all the characteristics of the composite material. It is possible to create a composite material that meets the specified requirements by collecting components that meet the optimal conditions [2,3].

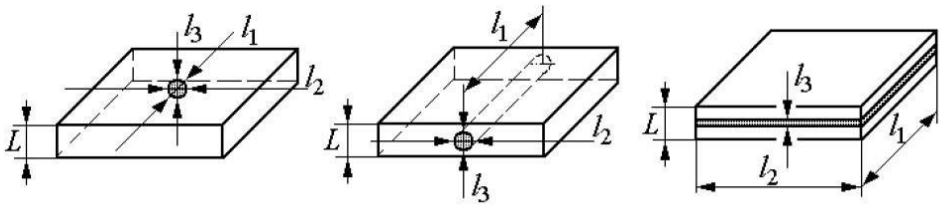


*Figure 2*. Reinforcement fillers: a- zero size, b - one size; v- two-dimensional, l1, l2, l3 - filler sizes; L is matrix thickness

$$\text{Specific modulus} = \frac{E}{\rho g},$$

$$\text{Specific strength} = \frac{\sigma_{ult}}{\rho g},$$

where $g$ is the acceleration due to gravity (32.2 ft/s² or 9.81 m/s²).

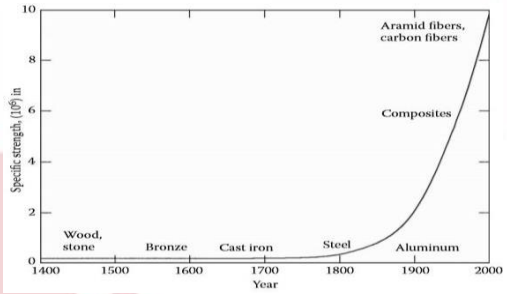


Figure.3. Shows how composites and fibers rate with other traditional materials in terms of specific strength

## Conclusion

In conclusion, composite materials have emerged as a significant area of study in the field of science. These materials, composed of two or more distinct components, offer unique properties and advantages over traditional materials. Through a combination of different materials, composites can exhibit enhanced strength, durability, and lightweight characteristics.

The study of composite materials has led to advancements in various scientific disciplines, including engineering, materials science, and aerospace. By understanding the composition and behavior of composites, scientists have been able to develop innovative applications in industries such as automotive, construction, and sports.

Furthermore, composite materials have the potential to address sustainability challenges. Their lightweight nature can contribute to fuel efficiency and reduce carbon emissions in transportation. Additionally, composites can be designed with recyclable or bio-based components, promoting a more environmentally friendly approach to material usage.

While composite materials offer numerous benefits, there are still challenges to overcome. These include manufacturing complexities, cost considerations, and long-term durability. Continued research and development efforts are necessary to optimize composite materials and expand their applications further.

In summary, the study of composite materials in science has provided valuable insights into their unique properties and potential applications. As researchers continue to explore and refine these materials, we can expect to see further advancements that will revolutionize various industries and contribute to a more sustainable future.

**References**

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