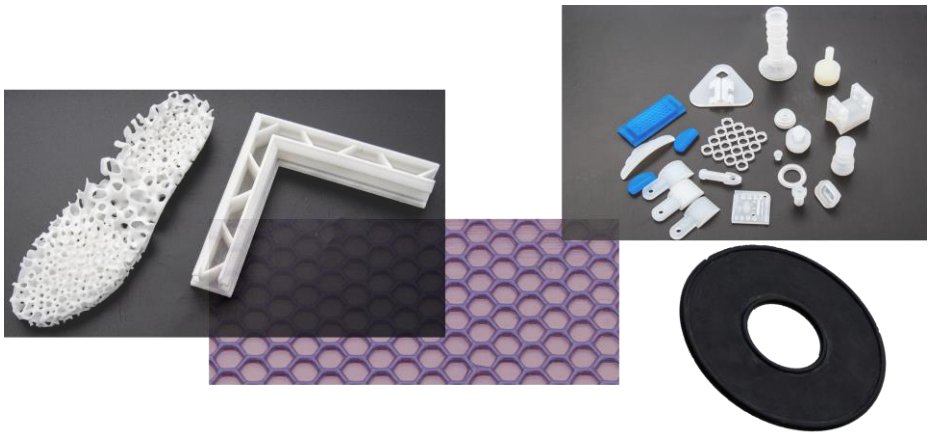


Elastomer, Silicone and Rubber-like Materials Printing

An overview of AM materials, technologies, and capabilities

Background

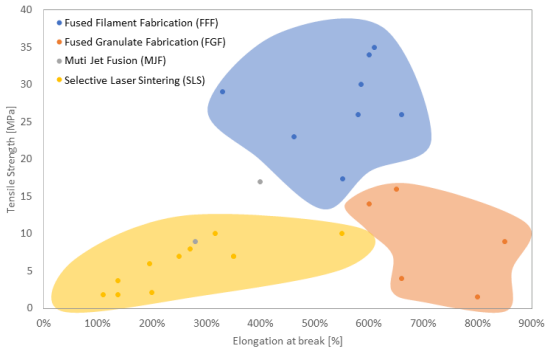
Soft and elastic polymers are characterized by high flexibility, endurance under stress, shock absorption, high elongation and chemical resistance. These unique properties make them ideal for applications such as seals, gaskets, shoe soles and protective casings, among others. A rapid evolution of the manufacturing technologies available for rubber and silicone materials has taken place in recent years, with additive manufacturing (AM) methods providing a wide variety of new alternatives. Therefore, a comprehensive assessment of different materials and technologies in this field is essential for finding the best use cases of additively manufactured elastomers.

Scope

In 2021, AMEXCI conducted a pre-study about rubber/silicone printing with the aim of evaluating the additive manufacturing technologies available to produce thermoplastic elastomers, silicones and rubber-like materials. The capabilities of different original equipment manufacturers (OEMs) and technology providers were compared to obtain an overview of current market trends and the performance of additively manufactured rubber/silicone parts.

Insights

There are eight different AM technologies that can print soft materials: Digital Light Processing (DLP), Fused Filament Fabrication (FFF), Fused Granulate Fabrication (FGF), Liquid Additive Manufacturing (LAM), Material Jetting (MJ), Multi Jet Fusion (MJF), Stereolithography (SLA), and Selective Laser Sintering (SLS). For thermoplastic elastomers, the most used technique is FFF, which produces parts by filament extrusion in a relatively fast manner. Although a smaller range of materials are commercially available for SLS and MJF, these techniques offer a more suitable alternative for mid-size production volumes, especially in complex parts.



In this pre-study, AMEXCI summarized the technical datasheet information on the mechanical properties from each material family (i.e., elastomers, silicones and rubber-like materials) categorized by printing process. As an example, the mechanical properties of thermoplastic elastomers printed with different AM technologies (FFF, FGF, MJF and SLS) are shown in the figure.

Thanks to the knowledge obtained from this pre-study, follow-up research projects could be initiated which aim at providing a better understanding of the mechanical properties of such materials for specific applications in different industries.

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The full version is available for participants of this project within AMEXCI's shareholder companies.