A novel metamaterial designed using AI to meet next generation requirements for rockets, missiles and other critical applications.

OVERVIEW

Arcarithm's Artificial Intelligence and deep learning algorithms, plus a dynamic new metamaterial called EXO-Resin™, offer a rapid prototyping solution for designing components for the next generation of missiles and other critical space applications. EXO-Resin combines advanced AI with a resin-based metamaterial to quickly analyze design needs and recommend a resin/substrate formula that simultaneously tests multiple properties for dramatically reduced development time.

MATERIAL ATTRIBUTES

- The base resin is resistant to high temperatures.
- Any number of substrates can be added to the base resin to add new characteristics.
- Self healing.
- Structural toughness.
- EMF/Radiological resistance.
- Arcarithm AI determines the substrates and concentrations needed to meet requirements.

Rapid prototyping and component production are core characteristics of EXO-Resin. Additive and traditional manufacturing are easily incorporated in the component development process.

Component Development and Procurement Process

1. Identify a component where conventional materials fall short of meeting requirements or an improved design would add value.
2. Provide a spec of the desired component and performance requirements (thermal, structural, radiation tolerance).
3. Arcarithm AI analyzes the requirements and provides a tailored formula of resin and substrate.
4. Arcarithm provides a prototype component using the tailored resin formula for evaluation and transition to production.

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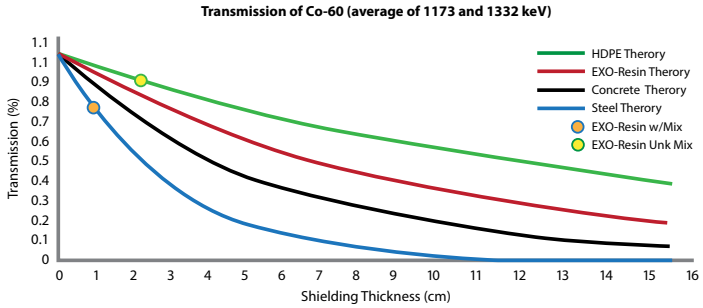
EXO-Resin™ Radiological Shielding

A cutting-edge lightweight and low viscosity material tailored to address complex radiation shielding challenges. Lighter than aluminum and steel with enhanced shielding capabilities. Substrates tailored to meet exact shielding needs. Developed as multi-part shields using component 3D scan data and 3D printed molds to cast a shield that matches the targeted area exactly, limiting any chance of leakage.



Material	μ/p (@662 keV)	Density (lb/ft³)	HVL (in)	Weight (lb per 1'x1')	Weight (Normalized to EXO-Resin w/ Tungsten)
Pb	0.107	709	0.23	13.3	0.89
EXO-Resin (W)	0.097	238	0.75	15.0	1.00
EXO-Resin	0.091	107	1.76	15.7	1.05
Concrete	0.079	144	1.50	17.9	1.20
Steel	0.067	501	0.51	21.3	1.42

EXO-Resin Properties

THERMAL RESISTANCE (M2-K/W)
1.52

THERMAL CONDUCTIVITY (W/M-K)
2.96

THERMAL CONDUCTIVITY (BTU IN/H FT² F)
2.97

FLEXURAL STRENGTH (MPA)
1.22

FLEXURE STRAIN @ BREAK (%)
1.08

FLEXURAL MODULUS (MPA)
2.12

UTS (MPA)
2.27

STRAIN AT UTS (%)
1.61

TENSILE STRESS AT YIELD (0.2% OFFSET) (MPA)
2.62

TENSILE MODULUS (MPA)
2.08

POISSON'S RATIO
1.57

COEFFICIENT OF LINEAR THERMAL EXPANSION (MM/M*°C)
2.85

SPECIFIC GRAVITY (SP GR 23/23°C)
2.00

DENSITY (KG/M3)
2.00

REVERSING CP OF SPECIMEN (J/G.°C)
1.36

SPECIFIC HEAT OF SPECIMEN (J/G.°C)
1.36

GLASS TRANSITION (°C)
1.10

ABOUT ARCARITHM

Deep Learning and Artificial Intelligence (AI) are buzz words commonly used throughout defense and commercial markets, often without true understanding of those terms. At Arcarithm, we are defining those terms and more, with proven solutions on par with multinational tech leaders. From the big picture distinction between strong and weak (or narrow) AI, to the fine-grained focus of deep versus shallow neural networks, Arcarithm delivers a depth of understanding and operational maturity beyond the capability of most companies. Our experience with every aspect of algorithm design, training, deployment and evaluation allows Arcarithm to produce quality products quickly and effectively, with the highest levels of reliability and accessibility.

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