



# MATERIAL DATABASE BOOK

## *User Instructions*



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## INTRODUCTION

In order to effectively search for materials in the Matech database it is opportune to follow a number of basic rules. Developed in collaboration with the University of Padua, the strength and innovation of the Matech Search software lies in its Search for Functional Properties method.

Besides the traditional metric properties found in its data sheet, every material also has different functional and perceptual properties.

At the same time, products must satisfy the needs connected to their intended uses. Through a classification of materials organised by functional properties, it is therefore possible to find new solutions for guaranteeing the performance of products in which respective materials are found.

For example, radiant elements for heat exchangers are primarily made in aluminium, which guarantees excellent thermal conductivity. The shapes and dimensions for this type of product are linked to the extrusion technology of aluminium.

Polymers traditionally have good features of thermal insulation, meaning they are not suitable for heat exchangers.

Thanks to technological progress, there are conductive polymers on the market capable of being used in heat exchangers through the injection technology of plastic materials. In contrast with extrusion, injection technology allows for the creation of more complex shapes.

Matech's search method is structured by this fundamental choice: to identify and classify all functional and perceptual properties of every single material.

## SEARCH BY ACQUIRED MATERIALS

If the user has purchasing access to Material Data Sheets, it is possible to search for previously acquired materials without having to select further options. The user's available credit is displayed on the search page on the top right of the screen.

## SEARCH BY MATERIAL FAMILIES

It is possible to search for materials belonging to one of the families in the archive.

When choosing a family, it is always necessary to select a property (minimum 1, maximum 3) and/or a keyword of at least 4 characters

## SEARCH BY NANOTECHNOLOGY MATERIALS

It is possible to refine the search field by limiting results to nanotechnology materials: however, it is necessary to combine the choice of this field with the selection of at least 1 functional property and/or 1 keyword of at least 4 characters.

## SEARCH BY FUNCTIONAL PROPERTIES

The search by functional properties has the advantage of not limiting results to any specific family of materials.

Therefore, it is possible to search for materials by selecting the desired functional properties and leaving the “Family” section undefined (click on the option button “any family”).

The software allows the user to set 1 to 3 functional properties at a time. If the search does not produce any results it means that there are no materials in the database which satisfy the functional properties selected.

If this is the case it is recommended to refine the search field by priority, decide which property is the most important among those previously selected and then to carry out a new search.

## SEARCH BY WORKING PROCESSES

Given that the entries listed are a selection of the most common techniques that can be used in the working and/or transformation of the material searched for, and so do not refer to the material’s production processes, it is possible to refine the search field by selecting a process.

However, it is necessary to combine this field with the selection of at least 1 functional property and/or 1 keyword of at least 4 characters.

## SEARCH BY KEYWORD

Searching by keyword follows the standard method of Internet search engines.

It is sufficient to insert the keyword properties of the material being searched for. Each keyword must have at least 4 characters.

The advantage of using keywords lies in the fact that every material in the database has a text description with indications on the applied sectors, production sites, perceptual properties, and so forth.

An example: if the keywords “sport” and “recyclable” are chosen, the results of all materials and all families that have applications in the sports sector with recyclable properties will appear.

If no significant results are found it means that no materials have those selected keywords in their description, and so it is necessary to use other research keys.

# GLOSSARY

TERM	DESCRIPTION
<b>Abrasion Resistant</b>	Material resistant to wear due to friction
<b>Absorbent</b>	Material capable of absorbing fluid
<b>Antibacterial</b>	Material capable of inhibiting the development and spread of micro-organism pathogens
<b>Anti-Fingerprint</b>	Material that does not show fingerprints when touched or held
<b>Anti-Slip</b>	Material with a high coefficient of friction, adhesive, with grip
<b>Anti-Static</b>	Material capable of dispersing or inhibiting the accumulation of electrostatic charges on surfaces, if appropriately grounded
<b>Aromatized / Flavoured</b>	Material with perceivable aromas or tastes
<b>Bio-Based</b>	Material that is entirely or partially obtained from natural resources
<b>Biocompatible</b>	Material that does not have harmful effects on natural biological functions and, more specifically, on human health
<b>Biodegradable</b>	Material that decomposes through the action of natural biophysical agents (micro-organisms, sunlight, humidity), resulting in non-pollutant compounds
<b>Blow Moulding</b>	Standard moulding process for thermoplastic materials which utilises compressed air to expand a preform (extruded or injected) until it adheres to the walls of the mould
<b>Breathable</b>	Material that is permeable to gas and vapour
<b>Casting</b>	Technique of filling a mould with a liquid in the absence of pressure
<b>Compostable</b>	Material that can produce substances such as fertilisers through biochemical decomposition
<b>Compression Moulding</b>	Compression technique of materials into free-flowing materials (granules/powders) or in preform within a hot mould
<b>Corrosion Resistant</b>	Material with high resistance to chemical damage caused by atmospheric agents and natural or synthetic substances
<b>Cut Resistant</b>	Material with high resistance to cutting from sharp or pointed objects
<b>Die Casting</b>	Metallurgical technique that consists in injecting molten metal under pressure into a mould
<b>Dielectric</b>	Insulating material typically used in in the construction of condensers
<b>Elastic</b>	Material that deforms in an entirely reversible and almost instantaneous manner if subjected to external stress

<b>Electrical Insulating</b>	Material with low electrical conductivity properties
<b>Electroconductive</b>	Material with properties of elevated electrical conductivity
<b>Energy Saving</b>	Material that over its life cycle allows for a reduction in energy use
<b>Extrusion</b>	Process of mechanical working where the material is pushed through a die of the desired cross-section
<b>Fire Extinguishing</b>	Material that interrupts the combustion process once the source flame is eliminated
<b>Fireproof</b>	Non-combustible material
<b>Flame Retardant</b>	Material with a smouldering combustion process
<b>Heating</b>	Heating Material capable of generating heat
<b>Hydrophilic</b>	Material that easily absorbs and retains water
<b>Hydrophobic</b>	Material with waterproof properties; water does not penetrate or wet the material
<b>Hypoallergenic</b>	Material that reduces or minimises allergic reactions
<b>Impact Resistant</b>	Material capable of absorbing impact energy and deforming without breaking
<b>Injection Moulding</b>	Standard moulding process of thermoplastic materials where material is fed into a closed mould at high pressure
<b>Iridescent</b>	Material that assumes rainbow-like colours when hit by light
<b>Lamination / Bonding</b>	Technique that allows for the joining of one or more materials in textile/film/plate form through heating or the use of glue
<b>Low Friction</b>	Material with a low coefficient of friction, designed to reduce the coefficient of friction between two surfaces or between two materials
<b>Luminescent</b>	Material capable of emitting light as a result of a chemical or physical process. This category includes phosphorescent, fluorescent, and electroluminescent materials
<b>Machining</b>	The mechanical working of complete materials (e.g. bars and slabs) to produce precision parts. Carried out by milling, turning, cutting and punching
<b>Magnetic</b>	Material that has the ability to generate a magnetic field. Magnetorheological Material that changes its viscosity as a result of a magnetic field
<b>Magnetorheological</b>	Material that changes its viscosity as a result of a magnetic field
<b>Magnetostrictive</b>	Ferromagnetic material which changes its shape when subjected to a magnetic field
<b>Mechanochromic</b>	Material capable of varying colour if subjected to mechanical action (compression, deformation, stretching, etc.)
<b>Phase Change Material</b>	Material capable of both storing and releasing heat through phase changes; for example, thermal-regulating resin which stores and releases heat as it changes from crystal to liquid and vice-versa

TERM	DESCRIPTION
<b>Photochromic</b>	Material able to vary its transparency or colour depending on variations in the intensity of incident light
<b>Piezoelectric</b>	Material capable of generating a current in a closed circuit if subjected to mechanical stress (direct effect): traction and compression generate currents in opposite directions. Instead, it undergoes deformation when subjected to an electric field (inverse effect)
<b>Pyroelectric</b>	Material that shows elevated temperature dependence of spontaneous polarisation. This effect translates into the generation of electrical signals as a result of temperature variations
<b>Recyclable</b>	Material that can be reused within a production process
<b>Recycled</b>	Material obtained from the recycling of other materials
<b>Reduced Emission</b>	Material that over its life cycle allows for a reduction of carbon dioxide in the atmosphere
<b>Reflective</b>	Material capable of significantly reflecting incident light
<b>Refractive</b>	Material capable of significantly refracting incident light
<b>Rheopectic</b>	Material whose viscosity increases when subjected to mechanical stress
<b>RTM (Resin Transfer Moulding)</b>	Standard process for composite materials which consists in pressure injection of resin into a closed mould containing a reinforcement
<b>Scratch Resistant</b>	Material with high surface resistance to scratching from sharp or pointed objects
<b>Shape-Memory</b>	Material that “remembers” its original shape. After plastic deformation, it is able to return to its original configuration when appropriately heated
<b>Sheet-Metal Working</b>	Technique of working at room temperature which includes bending, puncturing, ironing, rustication, drawing, folding etc.
<b>Shielding</b>	Material capable of partially or entirely reducing the intensity of magnetic waves
<b>Shimmering</b>	Material that changes colour depending on the direction of incident rays of light or depending on the angle of observation
<b>Sound Reflective</b>	Materials that reflect sound waves
<b>Soundproof</b>	Material that absorbs or reflects sound waves, thus limiting their transmission
<b>Stain Resistant</b>	Material that does not absorb or chemically interact with fluid substances. Normally used in reference to textiles or surfaces which are easy to clean
<b>Suitable for Food Contact</b>	Material suitable and/or certified for use in products in direct contact with foodstuff
<b>Thermal Insulating</b>	Material with low thermal conductivity properties

<b>Thermal Shock Resistant</b>	Material capable of resisting sudden and continuous temperature changes
<b>Thermochromic</b>	Material capable of varying intensity and colour tone as a result of temperature variations
<b>Thermo-Conductive</b>	Material with properties of elevated thermal conductivity
<b>Thermoforming</b>	Standard working of thermoplastic materials where a sheet/film is pre-heated and formed to the shape of a mould
<b>Thermoregulating</b>	Material capable of regulating its temperature, maintaining it within an optimum predetermined field
<b>Thixotropic</b>	Material that decreases viscosity when subjected to mechanical stress
<b>Transparent</b>	Material that allows for radiation to pass through it, specifically light
<b>Tri-Dimensional</b>	Material with a three dimensional optical effect, with depth of field
<b>UV Resistant</b>	Material that does not undergo chemical, optical, or physical alterations when exposed to ultraviolet radiation (sunlight)
<b>Vacuum / Pressure Bag</b>	Standard process of composite materials which utilises a mould that is half-rigid and half-composed of a flexible membrane that, once subjected to a vacuum or pressure, makes the composite adhere to the rigid side
<b>Vibro-Absorbent</b>	Material capable of dissipating mechanical energy created by vibration into other forms of energy (e.g. heat)
<b>Viscoelastic</b>	Material which, if subjected to external stress, deforms and slowly returns to its initial form once the load has been removed
<b>Waterproof</b>	Material capable of inhibiting the passage of fluids
<b>Welding</b>	Technique for joining two or more materials by adding thermal or mechanical energy







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