Reinventing thermal protection
Insulation and ablative materials
Cork, an exceptional raw material

Cork is the outer bark of the cork oak tree (Quercus suber L.), the 100% natural plant tissue covering the trunk and branches.

It consists of a honeycomb-like structure of microscopic cells filled with an air-like gas and coated mainly with suberin and lignin. One cubic centimeter of cork contains about 40 million cells.

Cork is also known as “nature’s foam” due to its alveolar cellular structure. It has a closed-cell structure making it lightweight, airtight and watertight, resistant to acids, fuels and oils, and impervious to rot.

It is sustainably harvested by specialized professionals without damaging the trunk, thus enabling the tree to grow another layer of outer bark that, in time, will be re-harvested. Over the course of the cork oak tree’s life, that lasts 200 years on average, the cork may be harvested around 17 times. This means that cork is not only a natural raw material, it is also renewable and recyclable.

| Cork cell microscopic view |

<table>
<thead>
<tr>
<th><strong>Elasticity</strong></th>
<th>Flexibility, installation and process friendly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration control</td>
<td>Impermeable to liquids</td>
</tr>
<tr>
<td>Chemical resistance</td>
<td>Thermal resistance</td>
</tr>
<tr>
<td>Shock absorption</td>
<td>Performance</td>
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</tbody>
</table>
Main advantages

Process friendly
Easily bonded to most substrate materials, using common adhesive systems. Can be trimmed and machined with regular tools or equipment without the need for any specific protection equipment. Easily covered with specific coatings or varnishes. Easily integrated on sandwiches (CFRP composites); no need for complex fitting techniques.

Custom materials
Materials are made of cork granules agglomerated with special phenolic binders that can be tailored to suit a particular requirement (fire-proof, anti-fungi, etc). Sheet thickness according with customer requirements. Specially graded cork granules can be supplied for your own products. Orders shipped worldwide from our two production sites (Europe and North America).

Proven technology
Our materials are used in TPS applications based in ablative heat shields in rocket applications as well as in space probes’ entry heat shields. Internal thermal insulation in hot structures. Impact protection due to debris mitigation or pyrotechnic solutions, in several launch vehicles.

Product Range

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>P45</th>
<th>P50</th>
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</thead>
<tbody>
<tr>
<td>Cork particle size</td>
<td>(mm)</td>
<td>1/2</td>
</tr>
<tr>
<td>Sheet dimension</td>
<td>(mm)</td>
<td>1270x760</td>
</tr>
<tr>
<td></td>
<td>(in.)</td>
<td>50x30</td>
</tr>
<tr>
<td>Density @ 20° C (a)</td>
<td>(kg/m³)</td>
<td>300–350</td>
</tr>
<tr>
<td></td>
<td>(lb/ft³)</td>
<td>19–22</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>(psi)</td>
<td>&gt;125</td>
</tr>
<tr>
<td></td>
<td>(MPa)</td>
<td>&gt;0,86</td>
</tr>
<tr>
<td>Elongation</td>
<td>(%)</td>
<td>&gt;30</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>(Btu in)/(h ft²°F) (c)</td>
<td>0,45</td>
</tr>
<tr>
<td></td>
<td>(W)/(m²K)</td>
<td>0,06</td>
</tr>
<tr>
<td>Specific Heat</td>
<td>(Btu/lb °F) (d)</td>
<td>0,6</td>
</tr>
<tr>
<td></td>
<td>(KJ/Kg/°K)</td>
<td>2,5</td>
</tr>
</tbody>
</table>

Substrates to bond: Metal and Composite

(a) ASTM F1315  (b) ASTM F152, Method B  (c) ASTM C177  (d) ASTM C351  Other sheet sizes may be available.
Since the dawn of the space age, Amorim Cork Composites has been supplying sheet materials or specially graded cork granules to the aerospace market worldwide.

Success Records

“60’s”
Scout
Mercury Spacecraft
Gemini Spacecraft
Saturn V

“70’s”
Apollo
Ariane 1
Viking Landers

“80’s”
Ariane 2
Ariane 3
Titan III

“90’s”
Space Shuttle
Ariane 4
Titan IV
Pegasus XL

“Today”
Mars Rovers
Delta IV
Beagle
Pegasus XL
Ariane 5
Atlas III-A
Atlas V
Vega
Falcon 9
IXV Spacecraft

“Cork is nature’s foam, a foam with unique combination of properties.”
in NASA Technical Reports Server
Amorim Cork Composites has been manufacturing and supplying cork-based materials used in Thermal Protection Systems for the Aerospace Industry since the dawn of the space age.

Our materials application portfolio ranges from Solid Rocket Boosters (SRB) to Expendable Launch Vehicle Systems (ELVS) that require thermal isolation and ablative thermal protection systems in various locations.
The data provided in this brochure refers to typical figures. This information is not intended to be used as a purchasing specification and does not imply suitability for use in any specific application. Failure to select the proper product may result in either product damage or personal injury. Please contact Amorim Cork Composites regarding recommendations for specific applications. Amorim Cork Composites expressly disclaims all warranties, including any implied warranties of merchantability or of fitness for any particular purpose. Amorim Cork Composites shall not be liable for any indirect, special, incidental, consequential or punitive damages as a result of using the information listed in this brochure, any of its material specification sheets, its products or any future use or re-use of them by any person or entity. For contractual purposes, please request our Product Specifications Sheet (PDS).