

# Materials used in Space Re-Entry Vehicles

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The basic materials used for thermal protection are Reinforced Carbon–Carbon, Low- and High-Temperature Reusable Surface Insulation tiles, Felt Reusable Surface Insulation blankets, Flexible Insulation Blankets, White and Black pigmented silica cloth, Fused silica and Metal. Reinforced Carbon-Carbon (RCC) is a light gray, all-carbon composite. RCC protects the orbiter's nose, chin and wing leading edges. Black tiles-known as High-Temperature Reusable Surface Insulation (HRSI) and White tiles-known as Low-Temperature Reusable Surface Insulation (LRSI) cover the lower and upper surface of the orbiter and other important areas. FRSI is used only on the upper section of the payload bay doors and the inboard sections of the wing upper surface. Flexible Insulation Blankets (FIBs) are used on the upper sidewalls of the orbiter's fuselage, sections of the payload bay doors and around the observation windows. A combination of white and black pigmented silica cloth makes up thermal barriers and is installed around penetrable areas. Fused silica is used for the outer windows in the orbiter. Metal is used for the forward reaction control system fairings and elevon seal panels on the upper wing elevon interface. All of the major ingredients in the Shuttle's external Thermal Protection System are bonded to the orbiter with the RTV adhesive. The cement will withstand temperatures as high as 550 degrees F without losing its bond strength. High costs are a deterrent to widespread application of these materials. But technological advances may make these pure, lightweight thermal materials the new insulators of the future.