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# Use of waste rigid polyurethane for making carbon foam with fireproofing and anti-ablation properties

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**Abstract:** A lightweight carbon foam, with a density of 0.57 g/cm$^3$, was prepared from powdered precursors containing waste rigid-polyurethane (RPU), novolac resin and coal-tar pitch. The waste RPU being 50 wt.% was used as a major pore former bonded by novolac resin (33 wt.%) and pitch (17 wt.%). A variant of this process utilized waste-resole resin of prepreg manufacturing plant in place of the novolac resin. These mixtures subsequently underwent molding, curing and carbonization without using any protective gas. Both types of carbon foams were described in terms of porosity, thermal and mechanical properties, but the investigations mainly focused on ablation testing, post-ablation morphology and back-face temperature. Overall, both types of specimens showed improved properties whereas the short-carbon fibers in the resole resin reflected in a higher porosity of 71.87%, improved compressive strength of 26.79 MPa and a lower erosion rate of 0.164 mm/s. During the fire-test, the specimen did not burn and remained colder at the other end. Very encouraging results were obtained in terms of surface

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