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PEEK-Polymer as a vacuum-window in high power rf-couplers

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PEEK is an advanced polymer known for its exceptional mechanical strength, thermal stability, and radiation resistance, making it a promising candidate for applications in extreme environments. This study explores the viability of PEEK as a vacuum window material in high-power radio frequency (RF) couplers. Traditionally, materials such as ceramics are employed for this purpose; however, they are costly to manufacture and impose limitations during the design process. PEEK offers additional advantages, including the possibility of additive manufacturing, which enables the integration of cooling channels for efficient thermal management. The research evaluates PEEK's electrical, thermal, and mechanical properties under conditions typical of high-power RF couplers, such as vacuum stability, RF-induced heating, and electromagnetic transparency. At the Institute for Applied Physics (IAP), PEEK is tested as a vacuum window material in high-power experiments up to 35 kW. Following these tests, the material is analyzed to assess its performance and suitability for RF applications.

Footnotes

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