# Direct metallisation method onto 3-D printed polyetherimide substrates

# 31: Direct metallisation method onto 3-D printed polyetherimide substrates

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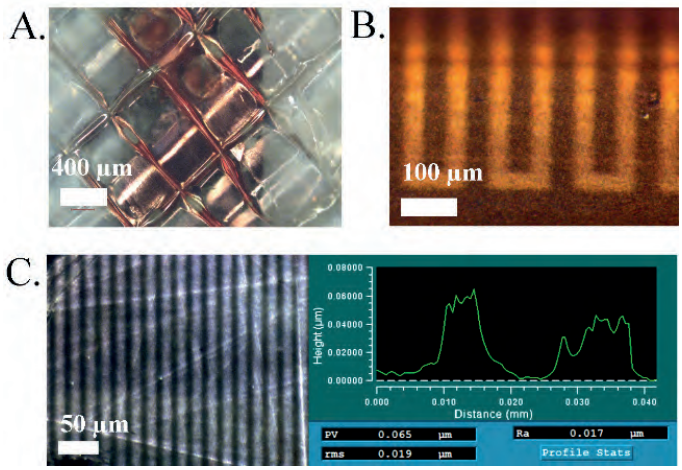
## ABSTRACT

Direct metallisation (DM) of tracks for electrical devices offers cost savings over traditional techniques due to the reduction of necessary lithographic manufacturing steps [1]. Additive manufacturing (AM), on its own, provides reduction in waste material and the formation of innovative 3-D shapes [2]. These two processes combined together for microelectronics manufacture, enable further economic benefits over existing manufacturing techniques. Polyetherimide (PEI) is a polymer used in AM whose properties enable its use for low error, high frequency electrical signal transmission and extreme environmental applications, such as space and aerospace [3]. Evidence has been provided in [4] for the enhanced optical sensitisation of PEI, enabling direct patterning for fast copper (Cu) track formation. Different PEI material shapes have been processed with enhanced sensitisation, to evaluate variability of the DM process for flexible and rigid electronics applications.

Highlighted in the figure are images of optically patterned PEI surfaces after electroless copper plating. The material surfaces include A) 3-D printed substrate, B) 1.75 mm diameter wire and C) 70 µm thick flexible substrate. The minimum feature size obtained was influenced by the roughness of the substrate and its flatness. The 3-D printed substrate show metal deposits of thickness 0.5 µm. The wire surface displayed a high uniformity enabling definition of 30 µm wide Cu features, although the curved surface limited the area patterned. The flexible substrate provided the highest feature resolution with 10 µm wide Cu features of thickness approximately 70 nm, as indicated in the track cross-section insert. After electroless Cu plating, the 3–D printed substrate and the wire showed conductivities approximately half of the value for bulk copper [5].

Direct metallisation of AM material PEI was successful using enhanced sensitisation chemistry, for a variety of material forms, where feature size and quality of tracks are limited by the substrate topography.




*Ultem 9085 Polyetherimide patterned with electroless copper for structures A) 3-D printed substrate, B) 1.75 mm diameter wire and C) 70 µm thick flex with cross-section profil*

References

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## BIOGRAPHY

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