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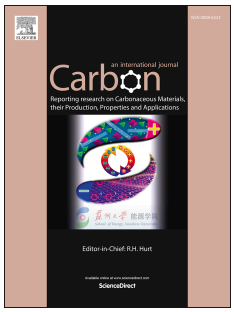

Direct Laser Writing for Creating Porous Graphitic Structures and Their Use for Flexible and Highly Sensitive Sensor and Sensor Arrays

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Direct Laser Writing for Creating Porous Graphitic Structures and Their Use for Flexible and Highly Sensitive Sensor and Sensor Arrays

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Abstract

One-step direct laser writing (DLW) method has been applied to fabricate flexible and conductive graphitic porous patterns or arrays from polyimide. With assistance of electron microscopy, Raman and energy dispersive spectroscopy, X-ray scattering, and the coupled electrical and mechanical test, a systematic processing-structure-property relationship study was performed to investigate the effect of laser power and scanning speed on the piezoresistive performance of the DLW generated graphitic sensor or sensor arrays. Within the range of processing conditions being studied, the sensor gauge factor showed an exponential dependence on the ratio of the laser power to the scanning speed. This finding allowed for the achievement of a high gauge factor of ~112. Lastly, the versatility of the one-step DLW generated graphitic sensors were demonstrated in different sensing applications, which include strain mapping of the high-performance polymeric composites, flexible and wearable sensor for gesture registration and man-machine interactions.

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