

ABSTRACT OF THE DISCLOSURE

Embodiments of the present disclosure relate to methods for depositing an amorphous carbon layer onto a substrate, including over previously formed layers on the substrate, using a plasma-enhanced chemical vapor deposition (PECVD) process. In particular, the methods described herein utilize a combination of RF AC power and pulsed DC power to create a plasma which deposits an amorphous carbon layer with a high ratio of sp³ (diamond-like) carbon to sp² (graphite-like) carbon. The methods also provide for lower processing pressures, lower processing temperatures, and higher processing powers, each of which, alone or in combination, may further increase the relative fraction of sp³ carbon in the deposited amorphous carbon layer. As a result of the higher sp³ carbon fraction, the methods described herein provide amorphous carbon layers having improved density, rigidity, etch selectivity, and film stress as compared to amorphous carbon layers deposited by conventional methods.

[Figure 2]