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Unusual conduction mechanism at graphitic carbon foam surfaces: An *ab initio* study[1] DAVID TOMANEK, ZHEN ZHU, ZACHARIAS G. FTHENAKIS, JIE GUAN, Michigan State University — Using *ab initio* electronic structure and quantum conductance calculations, we identify an unusual conduction mechanism at the surface of a previously described graphitic carbon foam structure. The emergence of a new, topologically protected conduction band in this semiconducting system is intimately linked to the topology of the foam. In contrast to conduction bands of graphitic structures, which are related to nearest-neighbor interactions between $p_\perp$ orbitals normal to the surface, the new band responsible for metallic behavior derives from interactions between $p_\parallel$ orbitals lying in the surface plane. The conducting surface state occurs on bare and hydrogen-terminated surfaces and is thus unrelated to dangling bonds. We find that the conductance behavior can be further significantly modified by surface patterning.

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