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Thermoelectric Power of Nanocrystalline Silicon Prepared by Hot-Wire Chemical-Vapor Deposition[1] BRIAN KEARNEY, Natl Research Council, XIAO LIU, Naval Research Laboratory, BATTOGTOKH JUGDERSUREN, Sotera Defense Solutions Inc., DANIEL QUEEN, Natl Research Council, THOMAS METCALF, JAMES CULBERTSON, CHRISTOPHER CHERVIN, RHONDA STROUD, Naval Research Laboratory, WILLIAM NEMETH, QI WANG, National Renewable Energy Laboratory — Although doped bulk silicon possesses a favorable Seebeck coefficient and electrical conductivity, its thermal conductivity is too large for practical thermoelectric applications. Thin film nanocrystalline silicon prepared by hot-wire chemical-vapor deposition (HWCVD) is an established material used in multijunction amorphous silicon solar cells. Its potential in low cost and scalable thermoelectric applications depends on achieving a low thermal conductivity without sacrificing thermoelectric power and electrical conductivity. We examine the thermoelectric power of boron-doped HWCVD nanocrystalline silicon and find that it is comparable to doped nanostructured silicon alloys prepared by other methods. Given the low thermal conductivity and high electrical conductivity of these materials, they can achieve a high thermoelectric figure of merit, ZT.

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