

BC8 Silicon is a Narrow-Gap Semiconductor

Scientific Achievement

BC8 Silicon (Si-III) is revealed to be a narrow-gap semiconductor instead of a semimetal as believed.

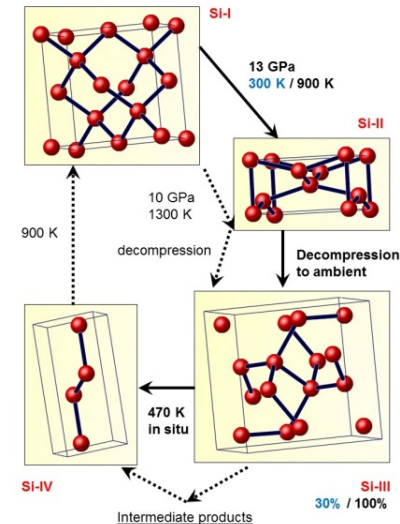
Significance and Impact

BC8 silicon, a Si allotrope that exists at ambient P - T conditions, had been accepted as a semimetal for 30 years. We demonstrate that BC8 Si is a Semiconductor with a 30 meV bandgap. Properties of the phase are characterized for the first time and energy implications discussed.

Research Details

Phase pure mm-size samples of BC8 Si were grown with high P - T methods with a multianvil press. Synchrotron IR, optical spectroscopy, electrical conductivity, Seebeck, and heat capacity measurements are all consistent with a narrow energy gap of 30 meV. The results are reproduced by first-principles calculations.

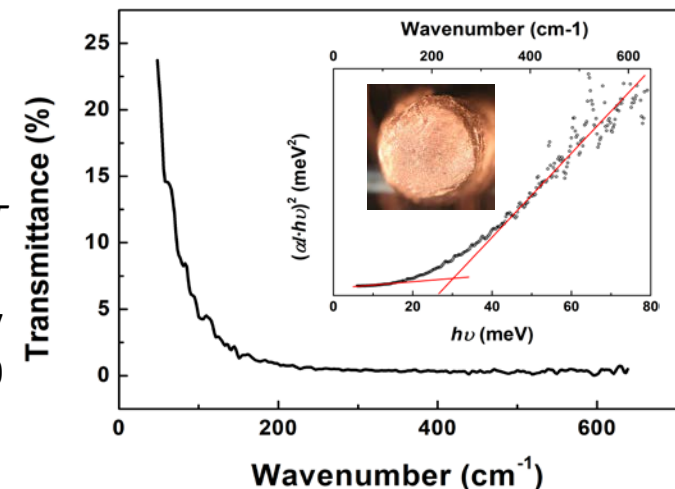
H. Zhang, H. Liu, K. Wei, O.O. Kurakevych, Y.L. Godec, Z. Liu, J. Martin, M. Guerrette, G.S. Nolas, and T.A. Strobel, *Phys. Rev. Lett.* 118, 146601 (2017).



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O.O. Kurakevych et al., *Inorg. Chem.* 55, 8943 (2016)

← BC8 Si



Transmittance spectrum of BC8 Si. Tauc plot (inset) of the absorption reveals the fundamental direct band gap transition.



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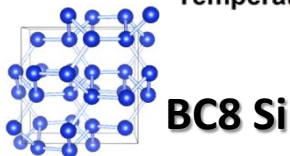
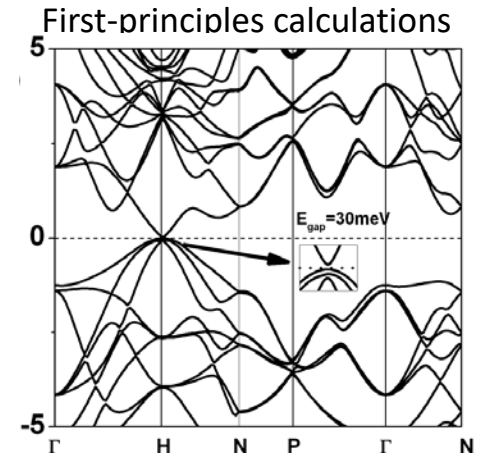
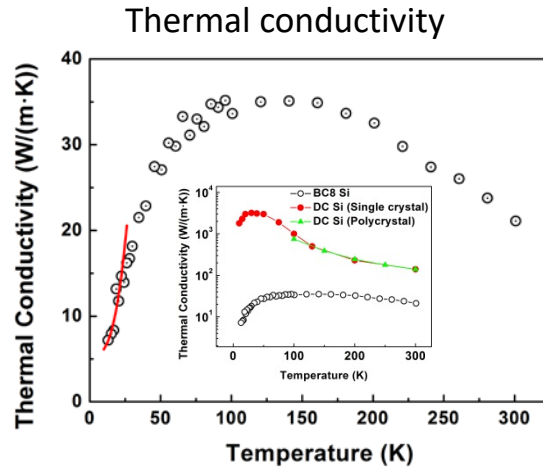
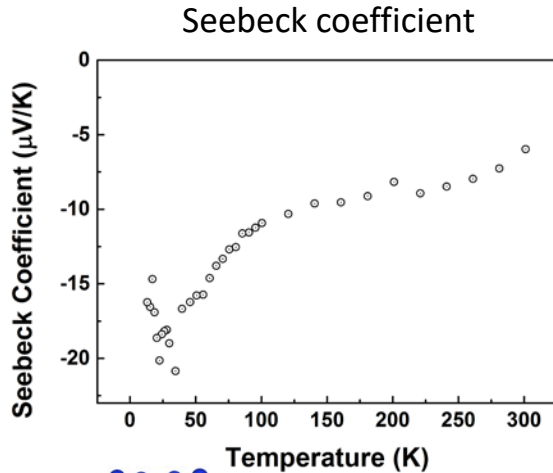
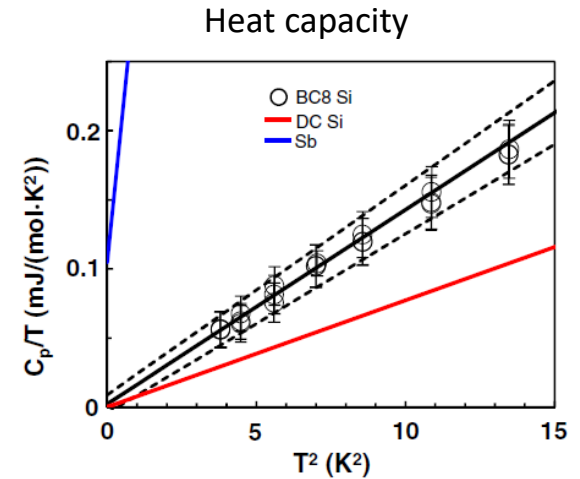
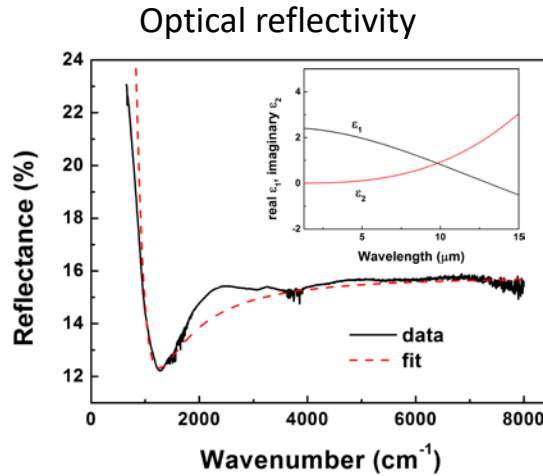
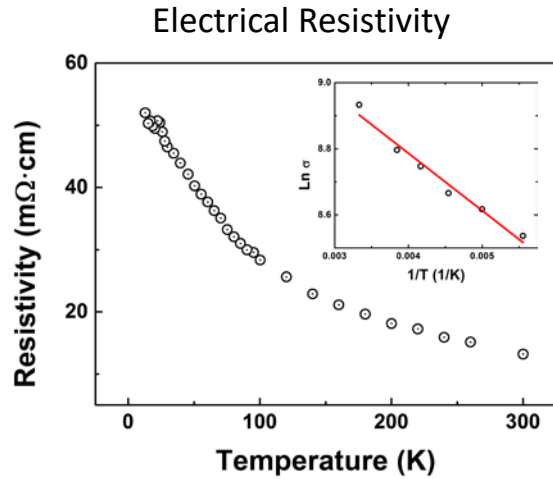
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BC8 Silicon is a Narrow-Gap Semiconductor (backup)



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