Thermoelectric properties of SiC/C composites from wood charcoal by pulse current sintering

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Abstract

Traditional energy production based on fossil fuels, such as oil, coal, and natural gas, is on the verge of exhaustion. Attention has gathered for thermoelectric energy conversion technology, as clean power generation, which does not depend on a fossil fuel. Many efforts are directed towards the development of materials to be used in thermoelectric conversion at high temperature. SiC is such a candidate material with a high thermal, chemical and mechanical stability. With this in mind SiC/C composites were investigated by sintering a mix of wood charcoal and SiO_2 powder (32-45 μm) at 1400, 1600 and 1800°C under N_2 atmosphere. Pulse current heating was applied, a method known for its fast sintering rate. SEM and EDX together with X-ray diffraction confirmed the presence of a 1μm thick layer of β-SiC being formed on the open pores and surfaces of the wood charcoal. Due to this coating it is possible to use this composite at least up to temperatures of 1800 °C. Thermoelectric properties were evaluated by measuring the Seebeck coefficient, the electrical resistivity and the thermal conductivity as a function of heating temperature and reaction time.