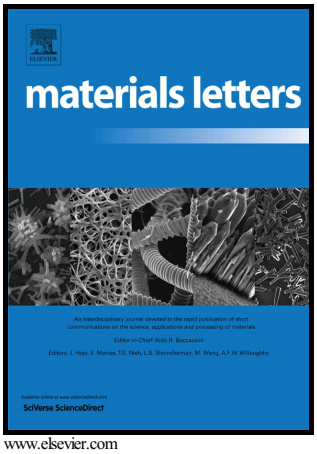

Acicular porous mullite from diatom frustules

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Abstract

We report for the first time using diatom frustules, the porous silica shells of diatoms, as Si precursor for synthesis of porous mullite ceramics with fibrous pore morphology. The porous mullite ceramics prepared by mould pressing method without using any porogen and binder showed high open porosity (up to 60%) due to the highly porous nature of diatom frustules and near zero sintering shrinkage of mullite whiskers. The original circular pores of diatom frustules were turned into fibrous pores of mullite ceramics. The porous ceramics showed flexural strength of 38.6 MPa at the porosity of 55.5% when sintered at 1600 ºC for 3 hours.

Keywords: Porous materials; Ceramics; Diatom frustules

1. Introduction

Porous ceramics are in demand for a broad range of functional and structural applications, such as filtration, catalyst support, absorption, refractory insulation, and bio-scaffold for tissue engineering [1–4]. Porous ceramics with fibrous pore structure formed by inter-knocked ceramic whiskers are thought to feature high flux as well as good mechanical properties [5]. Extensive attentions related to the fibrous pore ceramics have been paid to porous slicon nitride as β-Si_3N_4 features elongated grains. However, the high cost of production (non oxidizing atmosphere and extremely high sintering