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Fabrication and microstructure characterizations of transparent
polycrystalline fluorite ceramics

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Abstract: A approach to fabricating of transparent polycrystalline fluorite ceramic based on hot pressing sintering of fluorite mineral powders was proposed. Fluorite powders were obtained by ball milling naturally occurring fluorite mineral, and diameters of obtained powders were less than 100 μm . Transparent polycrystalline fluorite ceramic was fabricated by hot pressing sintering at 1100 $^{\circ}\text{C}$ for 3 h. The optical transmissivity reached about 60% in the infrared wavelength range (2.5 mm thickness specimen), and the average grain size was about 100 μm .

Keywords: Ceramics; Optical materials and properties; Fluorite mineral; Microstructure

1. Introduction

Transparent polycrystalline ceramics have gained greatly interest for various applications, including lamp envelopes, solid state laser host materials, transparent windows and armors, due to ceramics offer numerous advantages over their single crystal and glass counterparts [1]. Transparent polycrystalline ceramics are mostly fabricated from components with a cubic crystal lattice structure, such as YAG and fluorides[1,2]. Calcium fluoride (CaF_2) exhibits many excellent properties, such as broad range of optical transparency, low phonon frequency and low refractive indexes[3]. S.E. Hatch et al.[4] fabricated polycrystalline Dy: CaF_2 ceramics in 1964. Recently two approaches have been developed to fabricate fluoride ceramics[5,6]. M.Sh. Akchurin et al.[5] fabricated CaF_2 :Yb polycrystalline ceramics by hot deforming single crystals. P. Aubry et al.[6] used chemical synthesized particles to fabricate

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