Mechano-luminescence from Cr3+-doped glass ceramics and glass-crystal composites

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Abstract

Light emission in response to mechanical stimulation-termed mechanoluminescence (ML)-enables the optical detection and visualization of mechanical strain. In particular, materials with ML response in the transmission window of aqueous media or biological tissue enable in situ stress level monitoring, biophysical imaging or mechanically induced light delivery. However, most of today's ML materials are polycrystalline ceramics or ceramic particle composites, which puts constraints on their bulk processability, material homogeneity and optical transparency. Here, we demonstrate ML from transparent Cr3+ doped glass ceramics and glass-crystal composites by traditional melt-quenching methods and complementary characterization techniques. It is expected the ML properties of glass ceramics could offer valuable opportunities in the fabrication of functional glass with multiple responsive properties for smart glass and fiber sensors enable optical diagnoses, stress sensing and local heating.

Keywords: Glass ceramics, Mechanoluminescence, Cr3+

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