

Nd³⁺-doped transparent tellurite ceramics employed as bulk lasers

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Tellurite materials are drawing a lot of attraction mostly due to their remarkable nonlinear optical properties. In this work, we focus on the first transparent tellurite ceramic ever obtained for the specific 75TeO₂-12.5Bi₂O₃-12.5Nb₂O₅ (Bi_{0.8}Nb_{0.8}Te_{2.4}O₈) composition, via a simple process consisting in the full and congruent crystallization of the parent glass. However, while heating the starting Bi_{0.8}Nb_{0.8}Te_{2.4}O₈ glass system, the crystallization sequence appears more complex, as an intermediate Bi_{0.8}Nb_{0.8}Te_{2.4}O₈ anti-glass phase (polymorph 1) is first formed, before transforming into a more ordered transparent ceramic material (polymorph 2). A detailed and comprehensive structural study of the crossover between glass and its crystalline counterparts, carried out at different length scales, is therefore provided. Finally, lasing emission around 1064 nm with an excellent slope efficiency of ~50% is demonstrated in the case 1 mol.% Nd³⁺ doped polycrystalline bulk ceramics. These data definitely stand among the best results measured for bulk laser tellurites and thus demonstrate the potential of such polycrystalline transparent ceramics as optically active materials.

Keywords: transparent tellurite ceramics ; NIR bulk lasers