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Microwave-assisted solid state: a simple and rapid method to synthesize persistent perovskites.

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Sodium niobate ($NaNbO_3$) perovskites were synthesized through microwave-assisted solid-state synthesis - MASS in less than an hour exhibiting phase purity and persistent luminescence in the red region when doped with Praseodymium. The proposed synthesis method uses charcoal as a microwave susceptor. The material produced showed phase purity with 15 minutes heating at 500 W and its best result in terms of persistent luminescence was with 45 minutes at 500 Watts. The observed mechanism for persistent luminescence is described as: metal to metal charge transfer MMCT, which consists of the excitation of the dopant ion to the conduction band of the matrix where charge transfer from the dopant to the main ion (Nb) occurs. The electrons from the photoredox process are trapped in defect traps generated by the dopant in the band gap and released with heat gain, returning to the conduction band and subsequently to the ground state, generating emission [1]. This process competes with the $^3P_0 \longrightarrow {}^3H_4$ transition at 546 nm of the Pr^{3+} ion and as a result its green emission is not observed [1,2,3]. When studying the dopant variation, it was observed that the ideal concentration was 0.1% in mol, as at higher concentrations the persistence intensity decreases proportionally. This occurs due to the cross-relaxation phenomenon observed mainly with dopants such as praseodymium, which in excess ends up favoring the cross-relaxation process, generating less energetic couplings, disfavoring the emission [1]. The persistence time under the best concentration and synthesis conditions was around 120 seconds, but more precise analyzes are necessary to determine this value with greater precision.

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