

Structural and magnetic analysis of spinel high entropy oxides synthesized by sol-gel and solution combustion synthesis

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High-entropy oxides (HEO) belong to a group of promising materials with unique magnetic properties. In the present work, HEO materials with spinel structure and composition $(\text{Co}_{0.2}\text{Mn}_{0.2}\text{Mg}_{0.2}\text{Ni}_{0.2}\text{Zn}_{0.2}\text{Fe}_2)\text{O}_4$ were prepared by Pechini sol-gel (PSG) method and solution combustion synthesis (SCS). Both methods were used to obtain phase-pure polycrystalline materials with high homogeneity. The prepared powders were pressed by hydraulic press and cold isostatic pressing. Pressed green bodies were annealed at temperatures of 1173 and 1223 K. The annealing time was 2, 4 and 6 hours. The prepared samples were investigated in terms of phase composition, morphology, representation and distribution of individual elements and magnetic properties using X-ray powder diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray analysis (EDX) and SQUID magnetometry. The results of XRD, SEM and EDX showed that both procedures are suitable for the preparation of magnetic HEO materials with a spinel structure and a homogeneous distribution of metal cations. The prepared samples exhibit ferromagnetic behavior regardless of the preparation method, temperature and time of annealing. Samples are also characterized by relatively high saturation magnetization and low coercivity, indicating potential applications in the development of reversible magneto-active composites and energy storage [1,2].

References:

- [1] Z.Y. Liu, Y. Liu, Y. Xu, H. Zhang, Z. Shao, Z. Wang, H. Chen, *Green Energy & Environment* 8 (2023) 1341-1357
- [2] A. Sarkar et al., *Nature Communication* 9 (2018) 3400

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