High-Entropy Titanate-Based Perovskite Oxides

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High-entropy oxides (HEOs), also known as entropy-stabilized oxides, have recently been widely investigated by scientific communities due to their unique characteristics providing promising properties. This group of materials was firstly explored in alloy families as high-entropy-alloy (HEAs), which high configurational entropy is a key factor in governing stabilization of single-phase multi-cations compound. Recent studies have shown that HEOs can be successfully synthesized by well-known techniques and stabilized in various structures such as rocksalt, pyrochlore, perovskite, spinel, and fluorite. In this study, we focus on HEOs that are stabilized in the perovskite structure based on $ATiO_3$, which A is cations (5 or more) persisting similar ionic radii. Phase identification and crystal structure analysis revealed that a single-phase perovskite could be obtained by a conventional mixed oxide method. A-site modification by cation substitution could alter dielectric properties of the compound. Similarly, B-site doping with homo- and heterovalent cations could be achieved with limited doping concentration to maintain the single-phase perovskite. However, structural distortion was found to be more prominence in B-site modification than that of A-site modification. Based on this study, it should be noted that HEOs with perovskite structure need further investigation due to its flexibility in chemical manipulation and structural modification which can lead to promising electrical properties.