Understanding the Stability of Co in $SrTi_{1-x}Co_xO_{3-\delta}$ for Controlling B-metal Exsolution on Perovskite Materials

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Synthesizing well-distributed metal nanoparticles (NPs) on the surface of oxide support materials is very important for achieving a high catalytic activity for various applications. In this regard, B-metal exsolution has been received a lot of attention because well-distributed metal NPs with high stability can be successfully synthesized through exsolution phenomena.

Thus, we investigated the B-metal exsolution phenomena on Co doped $SrTiO_3$ (STC) as a model system for fundamental understanding of it. As a way to control B-site cation exsolution, we explored the effect of biaxial strains on B-site cation (Co) exsolution on $SrTi_{0.5}Co_{0.5}O_{3-\delta}$ (STC) to apply highly active exsolved Co NPs for oxidation catalysts.

We found that the Co exsolution can be facilitated under biaxial tensile strain due to the weaker bond strength of Co-O originated from the larger bond length of Co-O under tensile strain. It results in easier bond breaking between Co and O, thereby facilitating Co exsolution. For a practical approach, we also found that Co exsolution can be facilitated by doping the larger ionic radius of A-site cation (Ba) into Sr in STC which induces tensile strain around Co.