Perovskite materials of the form ABO3 are a promising family of compounds for use in solid oxide fuel cell (SOFC) cathodes. Study of the physics of these compounds under SOFC conditions with ab initio methods is particularly challenging due to high temperatures, exchange of oxygen with O2 gas, and correlated electron effects. This paper discusses an approach to performing ab initio studies on these materials for SOFC applications and applies the approach to calculate vacancy formation energies in LaBO3 (B = Mn, Fe, Co, Ni) compounds.