Alloys of Pt$_3$Ni and Pt$_3$Co have garnered attention as an improved cathode catalyst over pure Pt in polymer electrolyte membrane fuel cell applications. Experimental studies of the oxygen reduction reaction have shown an enhancement factor of 1.5 to 4 over pure Pt.

We study the oxygen reduction reaction on Pt$_3$Ni and Pt$_3$Co alloys using ab-initial methods. We compare eight different five-layer surface concentration cases for Pt$_3$Co. We compare different surface concentration of Pt alloys of Zn, Cu, Ni, Co, Fe, Mn, Cr, and Sc using a simple three-layer model. The binding energy of the intermediates in the oxygen reduction reaction was determined for Pt$_3$Ni and Pt$_3$Co. The effect of the second layer Ni or Co atoms in the alloys on the binding energy was significant. The effect of the atoms in the third layer and beyond was negligible. Barrier calculations for the rate determining OH formation step was determined.