What Is the Effect of Composition on the Reactivity of Dion-Jacobson Perovskites?

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The purpose of this project was to investigate the effect of different elements (Tantalum or Niobium) on the Al site on the reactivity on Dion-Jacobson perovskites. This information could possibly be used to create compounds, such as superconductors or semiconductors, with unique properties. This data could indicate what effect each element has on the compound's properties, like reactivity. The thesis was: If the composition of the perovskite is (MCl)PrNb2O7 (where M=V, Cr, Mn, Fe, Co, Ni, Cu, Zn), then the thermal energy applied to the system to achieve the ion exchange reaction and criteria for thermal decomposition will be higher than that of (MCl)PrTa2O7. To test this, the investigator created Tantalum perovskites with different transition metal chlorides. This data was obtained by comparing the time and temperature needed to create each compound with the corresponding compound of the Niobium series. This was achieved by using a trial and error approach reacting the Tantalum compounds perovskites at the same temperature as the Niobium compounds. If the compounds did not finish reacting or decomposed, the investigator altered the time and temperature for the next trial in order to get closer to the correct criteria. The data obtained from this method did not support my hypothesis and demonstrated that Tantalum series perovskites required more time and energy in order to react indicating a less reactive compound. Further research on different elements in different compounds may develop a trend to help in the development of new superconductors and semiconductors with unique properties.

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