# $K^+[K(CO)_8]^-$: an antipodal crystalline salt of alkalide $[K(C222)]^+K^-$

xiaoyong yang[1]

[1]Qilu University of Technology

November 16, 2020

## Abstract

Here we propose an antipodal conjecture, which is based on the synthetic scheme of alkalide $[K(C222)]^+K^-$ , to prepare $K^+[K(CO)_8]^-$. By introducing the concept of antipodal salts of alkalides, $K^+[K(CO)_8]^-$ is defined as antipodal salt of $[K(C222)]^+K^-$. As Group 1 elements of the Periodic Table, the alkali metal K is conventionally considered to form chemical bonding through its 4s and 4p valence orbitals. Our theoretical results show that the 3d orbitals of K element in $>[K(CO)_8]^-$ participate in chemical bonding of $>[K(CO)_8]^-$. This makes the alkali metal K shows typical transition metal chemical properties, which also provides the possibility for the synthesis of $K^+[K(CO)_8]^-$. Based on the Born-Haber thermodynamic cycle, the upper-limit stable temperature of $K^+[K(CO)_8]^-$ is estimated to be 24.426 K . Our theoretical results indicate that antipodal salts of alkalides will be a new family of compounds with good synthetic prospects.

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