World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:18, No:04, 2024

Deregulation of Thorium for Room Temperature Superconductivity

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Abstract : Abstract—Extensive research on obtaining applicable room temperature superconductors meets the major barrier, and the record Tc of 135 K achieved via cuprate has been idling for decades. Even though, the accomplishment of higher Tc than the cuprate was made through pressurizing certain compounds composed of light elements, such as for the LaH10 and for the metallic hydrogen. Room temperature superconductivity under ambient pressure is still the preferred approach and is believed to be the ultimate solution for many applications. While racing to find the breakthrough method to achieve this room temperature Tc milestone in superconducting research, a report stated a discovery of a possible high-temperature superconductor, i.e., the thorium sulfide ThS. Apparently, ThS’s Tc can be at room temperature or even higher. This is because ThS revealed an unusual property of the ‘coexistence of high electrical conductivity and diamagnetism’. Noticed that this property of coexistence of high electrical conductivity and diamagnetism is in line with superconductors, meaning ThS is also at its superconducting state. Surprisingly, ThS owns the property of superconductivity at least at room temperature and under atmosphere pressure. Further study of the ThS’s electrical and magnetic properties in comparison with thorium di-iodide ThI2 concluded its molecular configuration as [Th4+(e-)2]S. This means the ThS’s cation is composed of a [Th4+(e-)2]2+ cation core. It is noticed that this cation core is built by an oxidation state +4 of thorium atom plus an electron pair on this thorium atom that resulted in an oxidation state +2 of this [Th4+(e-)2]2+ cation core. This special construction of [Th4+(e-)2]2+ cation core may lead to the ThS’s room temperature superconductivity because of this characteristic electron lone pair residing on the thorium atom. Since the study of thorium chemistry was carried out in the period of before 1970s. the exploration about ThS’s possible room temperature superconductivity would require resynthesizing ThS. This re-preparation of ThS will provide the sample and enable professionals to verify the ThS’s room temperature superconductivity. Regrettably, the current regulation prevents almost everyone from getting access to thorium metal or thorium compounds due to the radioactive nature of thorium-232 (Th-232), even though the radioactive level of Th-232 is extremely low with its half-life of 14.05 billion years. Consequently, further confirmation of ThS’s high-temperature superconductivity through experiments will be impossible unless the use of corresponding thorium metal and related thorium compounds can be deregulated. This deregulation would allow researchers to obtain the necessary starting materials for the study of ThS. Hopefully, the confirmation of ThS’s room temperature superconductivity can not only establish a method to obtain applicable superconductors but also to pave the way for fully understanding the mechanism of superconductivity.

Keywords : co-existence of high electrical conductivity and diamagnetism, electron pairing and electron lone pair, room temperature superconductivity, the special molecular configuration of thorium sulfide ThS
Conference Title : ICAS 2024 : International Conference on Applied Superconductivity
Conference Location : Lisbon, Portugal
Conference Dates : April 11-12, 2024