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SEMINAR
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Shaping the Potential Technology of Rare Isotopes through Their Coordination Chemistry

Abstract: The demand for isotopes in energy and medical applications is continuously increasing. Although hundreds of isotopes have specific applications, the demand and interest for promethium-147 (^{147}Pm) and radium-223 (^{223}Ra) are rapidly growing for their applications in lightweight nuclear energy sources and targeted alpha therapy (TAT), respectively. Currently, Oak Ridge National Laboratory is one of the primary producers of ^{223}Ra , which has its own challenges regarding its radioactive nature, and the only producer of ^{147}Pm , which is the only lanthanide element within the 4f series that does not have any stable isotopes. Although ^{147}Pm is one of the few isotopes suitable for betavoltaic batteries and ^{223}Ra is the only approved alpha therapeutic, the scarcity, radioactivity, and challenging chemistry of these isotopes have severely hindered growth in their respective applications.

Similar to other lanthanides, ^{147}Pm chemistry is primarily driven by electrostatic coordination interactions with ligands. Similarly, ^{223}Ra is the largest divalent metal ion on the periodic table, which also makes it a very weak Lewis acid and relegates its chemistry to coordination interactions. Although the uses of these two isotopes greatly diverge, their coordination chemistry strongly influences their properties and behavior in their respective applications. By obtaining some of the first single crystal structures of both radium and promethium coordination compounds, knowledge is gained about how these elements behave with ligands. This talk aims to demonstrate how we overcame the challenges associated with promethium and radium to elucidate their coordination chemistry. Furthermore, insight into how these results could shape the future technology associated with ^{147}Pm and ^{223}Ra is discussed.

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Meet the Speaker
Seminar

2:00 pm, PCB 3144
3:35 pm, King 159