



**Illinois Wesleyan University**  
**Digital Commons @ IWU**

---

John Wesley Powell Student Research  
Conference

2001, 12th Annual JWP Conference

---

Apr 21st, 2:00 PM - 3:00 PM

## Synthesis and Derivitization of Keggin Type Polyoxometalates

Jacqui Hoffman, 01  
*Illinois Wesleyan University*

Rebecca Roesner, Faculty Advisor  
*Illinois Wesleyan University*

Follow this and additional works at: <https://digitalcommons.iwu.edu/jwprc>

---

Hoffman, 01, Jacqui and Roesner, Faculty Advisor, Rebecca, "Synthesis and Derivitization of Keggin Type Polyoxometalates" (2001). *John Wesley Powell Student Research Conference*. 12.

<https://digitalcommons.iwu.edu/jwprc/2001/posters2/12>

This Event is protected by copyright and/or related rights. It has been brought to you by Digital Commons @ IWU with permission from the rights-holder(s). You are free to use this material in any way that is permitted by the copyright and related rights legislation that applies to your use. For other uses you need to obtain permission from the rights-holder(s) directly, unless additional rights are indicated by a Creative Commons license in the record and/ or on the work itself. This material has been accepted for inclusion by faculty at Illinois Wesleyan University. For more information, please contact [digitalcommons@iwu.edu](mailto:digitalcommons@iwu.edu).

©Copyright is owned by the author of this document.

Poster Presentation 8

**SYNTHESIS AND DERIVITIZATION OF KEGGIN  
TYPE POLYOXOMETALATES**

Jacqui Hoffman and Rebecca Roesner\*

Department of Chemistry, Illinois Wesleyan University

Polyoxometalates are early-transition metal-oxygen clusters. The Keggin ion,  $\text{XM}_{12}\text{O}_{40}^{n-}$  is one of the most useful polyoxometalates. The triangular arrays of oxygen atoms present on the surfaces of polyoxometalates are similar to the patterns seen on bulk metal oxide surfaces. Polyoxometalates are therefore excellent compounds for both homogeneous and heterogeneous catalysts.

The Keggin ion can be synthesized with a W-O group missing resulting in a vacancy in an otherwise symmetric molecule. Keggin-type polyoxometalates with mono-lacunary structures of formula  $\text{XM}_{11}\text{O}_{39}^{n-}$ , provide a rigid, hydrolytically stable, thermally robust, nonoxidizable framework that behaves as a pentadentate ligand. It is possible to attach organic ligands to the surface of this cluster by inserting another metal atom, one capable of forming a bond with carbon, into the vacancy. The organic ligand can then attach to biomolecules at specific sites. The polyoxometalate adds an appreciable amount of electron density to the biomolecule, thus polyoxometalates are useful in enhancing contrast in electron microscopy. It may also be possible to develop drugs, which "seek out" diseased cells. Before this can be accomplished fundamental techniques for forming polyoxometalate carbon bonds must be developed.

Mono-lacunary Keggin ions with  $\text{X}=\text{P}, \text{Si}$  have been synthesized. The tungstophosphate ion has been characterized by  $^{31}\text{P}$  NMR, FT-IR and UV analysis. A rhodium atom bearing a  $-\text{CH}_2\text{COOH}$  functional group was then inserted into its vacancy. This compound was characterized by FT-IR,  $^1\text{H}$  NMR,  $^{31}\text{P}$  NMR. Attempts to convert the carboxylic acid functional group to an amide failed. Current efforts are aimed at the characterization of tungstosilicate ion. Attempts will then be made to insert  $\text{Rh}-\text{CH}_2\text{COOH}$  into its vacancy and convert the carboxylic acid functional group to an amide.