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Attaching Organic Ligands to the Keggin Ion

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Poster Presentation 18

ATTACHING ORGANIC LIGANDS TO THE KEGGIN ION

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Polyoxometalates are early transition metal-oxygen cluster compounds. Such complexes are known to be valuable catalysts, analytical reagents, and electron mircoscopy stains. Another potentially important application of heteropoly species is in clinical medicine. Several polytungstates have significant antiviral and antitumoral activity. The Keggin anion, $XM_{12}O_{40}^{-n}$, shown in figure 1, is among the most biologically active polyoxometalates.

By attaching organic molecules to the surface of this cluster, it may be possible to

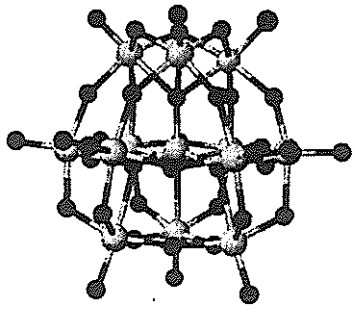

Figure 1

develop drugs which "seek out" diseased cells. Before this can be accomplished, however, fundamental techniques for forming polyoxometalate-carbon bonds must be developed.

The first molecule that we synthesized was a lacunary Keggin ion. A lacunary ion has one W-O group missing resulting in a vacancy in an otherwise symmetric molecule. The structure was confirmed by ^{31}PNMR, FT-IR and UV analysis. A carboxylate functional group was then attached to the lacunary ion by inserting a rhodium atom bearing a $-CH_2COOH$ ligand. The color change from white to orange (indicative of rhodium) signified successful substitution of the vacancy. The product was analyzed by ^{1}HNMR and FT-IR. A ^{31}PNMR spectrum was also obtained which showed the expected chemical shift. In the next and final step, we attempted to convert the carboxylate group to an amide through an anhydride intermediate.