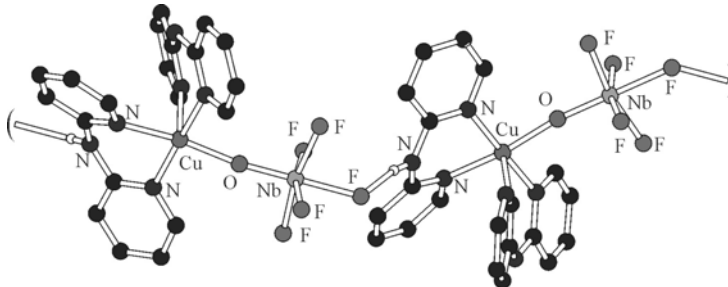


**Noncentrosymmetric Inorganic-Organic Materials.** Kenneth R. Poeppelmeier, Dept. of Chemistry, Northwestern Univ., krp@northwestern.edu

Solid state materials display important physical properties, such as piezoelectricity, ferroelectricity, and nonlinear optical behavior, when they adopt noncentrosymmetric structures. The early transition metal oxide fluoride anions  $[\text{VOF}_5]^{2-}$ ,  $[\text{NbOF}_5]^{2-}$ ,  $[\text{TaOF}_5]^{2-}$ , and  $[\text{MoO}_2\text{F}_4]^{2-}$ ,  $[\text{WO}_2\text{F}_4]^{2-}$  from Groups 5 and 6, respectively, are well known inorganic species with large average nonlinear optical (NLO) bond susceptibilities. In the solid state, owing to disorder in the O/F metal bonds, these ions are seldom



observed in noncentrosymmetric structures despite their acentric local structure. Coordination to the most charged (basic) sites eliminates the O/F disorder and reveals the cis- or trans-directing property of the particular  $\{\text{MO}_x\text{F}_y\}^{2-}$  species in the solid state. For example,  $\{\text{Cu}(\text{dpa})_2\}^{2+}$  (where dpa is 2,2'-dipyridylamine) with  $C_1$  symmetry and the trans-directing  $\{\text{MOF}_5\}^{2-}$  ( $M = \text{Nb}, \text{Ta}$ ) units form one dimensional chains with their  $M = \text{O}$  bonds aligned in a polar fashion. Other strategies for chiral, polar or chiral-polar structures will be presented.