



Safe, Sustainable and Selective Methods for Dissolution and Recovery of Noble Metals

Noble metals, especially platinum and gold, have a growing demand in the modern society due to their use in various applications such as catalysis, electronics, sensing and in the pharmaceutical industry. The importance of recovering noble metals from low concentration ores as well as from secondary resources such as electronic waste is expected to grow continuously since noble metals are scarce on earth. Noble metals have to be separated by dissolution techniques before they can be used. Most dissolution techniques contain highly harmful and toxic reagents, such as cyanide or halogen-containing solutions. These conventional dissolution methods have a high environmental burden and have caused severe environmental disasters previously. Considering the safety of the dissolution processes used today and the growing demand of high-purity noble metals, it is clear that sustainable and safe routes for noble metal dissolution and recycling are highly needed.

Our group has developed several organic etchant systems which are based on a 4-pyridinethiol (4-PS) ligand and its derivatives. These systems are able to oxidatively dissolve gold (Figure 1). The objective of the project is to develop new, efficient, sustainable and safe etchants for selective dissolution and recovery of noble metals. To reach this goal, the following aspects are considered: **1)** development and selection of S-donor containing etchants for different noble metals, **2)** recovery of metals from etchant solutions, **3)** mechanistic studies, and **4)** recyclability of the etchant. This project is mainly related to inorganic, organic, analytical and physical chemistry but has confluences to environmental science, geology, and engineering sciences. In larger context, the results of this project can influence environmental and health implications of mining and sustainable processing of noble metals from mineral and secondary resources.

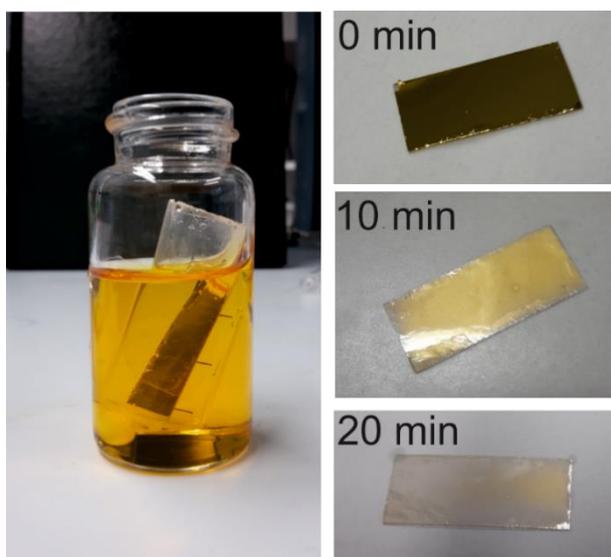


Figure 1. A propagation of Au thin film dissolution in 4-PS based etchant.



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