Exploration of Crystalline Proton Sources

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Many important acids come in the form of aqueous solutions. This presents a problem to many chemists who cannot introduce water into their reactions without reducing yields or destroying their desired product altogether. Alternatively, some of these acids are also available as gases, which can be stored in pressurized tanks. This allows chemists to use these acids without having to worry about introducing unwanted quantities of water into their reactions. However, storing and using hazardous gases under pressure in the laboratory has always presented a serious safety concern as well as a number of more practical inconveniences.

Based on the above set of concerns, it is obvious that a safer and more practical alternative to aqueous acids would be well received by those who use them on a daily basis. The purpose of this project was to explore alternatives to gaseous and aqueous acids, specifically in researching the possibility of crystalline proton sources that would behave analogously to gaseous and aqueous acids.

Research was conducted on a variety of crystalline acid candidates by means of X-ray crystallography and acid-base titrations. In the end, the most promising result was the compounds acetamide hemihydrate, dichloride, and propionamide hydrochloride. These compounds were found to behave as crystalline analogues to hydrochloric acid. It is the researcher’s hope that these compounds may find applications in future synthetic endeavors.