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Trash to Treasure: Changing a Poorly Diffracting Frozen Crystal to a High Resolution Data Set. Kris F. Tesh*, A. L. Dowell, Joseph D. Ferrara, J.W. Pflugrath, Rigaku, 9009 New Trails Dr., The Woodlands, TX 77381, Tel: +1 (281) 363-1033 / Fax: +1 (281) 364-3628 / www.Rigaku.com

One of the primary concerns in modern crystallography laboratories is to develop protocols for improving poorly diffracting crystals. Crystals are optimized by changing a number of parameters during crystallization (salt, buffer concentration, pH, additives, etc.). Additionally, post-crystallization techniques include replacing water with additives (PEG, sugars, salts), dehydrating in air or under oil, and cryo-annealing. Much of what is done today is not reproducible and lacks the ability to improve a very poor quality, mounted crystal. In the case of “bad” diffraction, the usual thought is to cut your losses and mount a new crystal; in the worst case, you go back and attempt to grow better crystals. But, this may not need to happen. If there is evidence of better diffraction from previous crystals, or if there are few options due to little available protein, you may wish to “heal” a crystal. The Free Mounting System (FMS) is used to carefully regulate and adjust the relative humidity about a mounted crystal, which changes the water content within the crystal. Previously flash-cooled crystals of very poor quality will be shown to improve as a result of FMS rescue and rehabilitation, even to the point of usable data.