

The Synergy Story

By Paul Swepston, Global Manager, Rigaku Oxford Diffraction

At the end of April 2015, Rigaku acquired Agilent Corporation's single crystal business. From the beginning, the new combined single crystal division was named Rigaku Oxford Diffraction to pay homage to Oxford Diffraction, the original X-ray company that Agilent acquired. Our intent was to equally merge the two groups and create a synergistic effect in our single crystal product development. Aptly named, the first diffractometer to be developed by our combined group is called the XtaLAB Synergy. It is available in two flavors: XtaLAB Synergy-S is configured with one or two microfocus sealed tube X-ray sources and XtaLAB Synergy-R is configured with a microfocus rotating anode X-ray source.

True to its name, the XtaLAB Synergy diffractometer is derived from ideas and concepts that originated in Agilent's former R&D center in Wroclaw, Poland and from Rigaku's R&D centers in Tokyo, Houston and Detroit. In addition, sales, marketing and service personnel from around the world added input into the design process. The resulting diffractometer is a testament to the single crystal knowledge that resides within the Rigaku Oxford Diffraction group.



XtaLAB Synergy-S

Our goal was to release the first XtaLAB Synergy model within one year of the creation of Rigaku Oxford Diffraction. We accomplished this with the release of XtaLAB Synergy-S at the British Crystallographic Association (BCA) meeting that was held in Nottingham in early April 2016. The week after the BCA meeting, the XtaLAB Synergy-S was measuring data for customer demonstrations in our application lab outside of Oxford. The first installation of the XtaLAB Synergy-S at a customer site occurred at ETH Zurich in August 2016. During the same month, XtaLAB Synergy-R was introduced at the European Crystallographic Meeting (ECM) in Basel, Switzerland.



Rigaku Oxford Diffraction colleagues, Marcus Winters and Damian Kucharczyk at the release of XtaLAB Synergy-R at ECM meeting

The XtaLAB Synergy diffractometer has a number of significant improvements over its predecessors. Using a combination of leading-edge components and user-inspired software tied together through a highly parallelized architecture, the XtaLAB Synergy-S produces fast, precise data in an intelligent fashion. The new kappa goniometer has been redesigned to incorporate faster motor speeds and a unique telescopic two-theta arm to provide total flexibility for your diffraction experiment. The goniometer is compatible with a wide range of detectors to suit the needs of the individual customer. A user-inspired cabinet design gives improved workflow and new electronically controlled cabinet lighting, and crystal lighting improves the ergonomics of the system.

The XtaLAB Synergy-S is based around our new PhotonJet-S series of microfocus sources. These third-generation sources have been designed to maximize X-ray photons at the sample by using a combination of new optics, new, longer life, tubes and an improved alignment system. PhotonJet-S sources are available in Cu, Mo or Ag wavelengths in either a single or dual source configuration. The higher source flux and increased goniometer speed benefits the user by allowing quicker, more agile experiments.

The XtaLAB Synergy-R is the most powerful small molecule diffractometer available. It includes a high-flux, low-maintenance microfocus rotating anode, the PhotonJet-R, with a high-precision kappa goniometer and Rigaku's own Hybrid Photon Counting detector (HPC) the HyPix-6000HE. The PhotonJet-R X-ray source is comprised of a MicroMax-007 HF rotating anode and a newly designed optic. It is available with either Cu or Mo anodes.

For labs with high-throughput requirements, increasing the flux will reduce data collection time and thus increase the number of samples that can be studied. For extremely small samples, additional flux will extend the minimum size limits for crystals that can be studied.

A unique combination of cutting edge technologies allows the XtaLAB Synergy-R to claim the title of "World's Fastest Diffractometer". The synergistic effect of a bright X-ray source, a fast goniometer, an extremely low-noise, photon-counting detector, a fast and efficient strategy algorithm, and a highly parallelized control/processing software package leads to an instrument that can perform a single crystal experiment so rapidly that, for normal crystals, XtaLAB Synergy-R can be considered a walkup structure solution machine. For difficult samples, the XtaLAB Synergy-R can greatly reduce data collection time and it has the flexibility to easily help you optimize your experiment.



XtaLAB Synergy-R

This tightly integrated instrument has four basic areas of technology. First, the PhotonJet-R X-ray source is based on the widely used MicroMax™-007HF rotating anode generator with newly designed Osmic confocal optics, a continuously variable slit assembly, and improved alignment capabilities. Second, the efficient kappa goniometer has been sped up to minimize time between frames, as well as allowing ultra-fast scan speeds to take advantage of the bright X-ray source. Third, Rigaku's HyPix-6000HE detector is a direct detection, photon-counting detector with extremely low noise and high dynamic range. Weak and strong reflections can be measured simultaneously on the same frame, thus reducing overall data collection time. Finally, sophisticated software algorithms tie the hardware together to minimize the time it takes to measure and solve single crystal structures.



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