

Application Title: Enhancing Access to X-ray Scattering instruments for Polymers and Nanoparticles.

Lead contact for RDF Application:

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Key Participating Units: College of Science, College of Engineering, College of Agriculture, Health Science Center.

Anticipated Request Amount (\$): \$200,000

Executive summary of this application to utilize Research Development Funds:

We are requesting funds to upgrade two of the X-ray scattering instruments in the X-ray laboratory with two new Hybrid Pixel Area Detectors (HPAD) for the purposes of polymer and nanomaterials characterization. The upgraded HPAD will replace lower resolution and high-background CMOS area detectors, which while being adequate for single crystal measurements are not of sufficient sensitivity for research quality polymer and nanomaterial characterization. As such, for a relatively modest investment, the X-ray laboratory will be able to greatly expand its user base, facilitate a class of measurements not currently accessible on campus, and cater to the needs of multiple research groups across campus. In turn, we will transfer our CMOS detectors to older single-crystal X-ray diffractometers, which currently employ obsolete CCD detectors (which are **not** supported by the manufacturer and cannot be repaired if they fail) thus extending the lifetime of our older instruments. In fact, an upgrade of our X-ray detectors will extend the useful lifetime of all of our instruments by another 10 years and provide new capabilities for characterization of polymeric and nanomaterial samples that will provide a competitive advantage to Texas A&M researchers.

Wide-angle X-ray Scattering (WAXS) two-dimensional characterization is an important tool to the polymer and/or nanomaterial researcher and is unavailable to researchers at Texas A & M University. The upgrade will enable measurements for which there is a high demand on campus and facilitate critical translational research on polymers and nanomaterials, which will expand the scope and depth of innovation at the university. There are presently 35 PIs from 9 different departments and three colleges who engage in polymer sciences and 14 PIs from 7 different departments who are engaged in nanomaterials research. Of these two groups of researchers, 33 PIs are present users of the X-ray laboratory. There are also numerous additional investigators who use the X-ray Laboratory for projects outside of polymer and nanomaterials research. Indeed, the user base includes a total of 112 active research groups with 64 in Engineering, 31 in Chemistry, 8 in Physics, 3 in Agriculture, 2 in Pharmacy, 2 in Oceanography, 1 at the Cyclotron and 1 in Geology, making the X-ray Laboratory one of the most widely used multidisciplinary, intercollegiate, and interdepartmental facility on campus. The total external funding for these groups is in the tens of millions per year; a poll of our users suggests that 70% of the users would benefit from the proposed upgraded instrumentation. It follows that the proposed upgrade will greatly benefit the institution as a whole and provide a large number of researchers with a distinctive competitive advantage in terms of materials characterization. Finally, we note that these gains will come at relatively low cost (\$200K), with no associated recurring costs.