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Diamonds are Forever: Structural-chemical Characterization of Kimberlite Indicator Minerals as a Reconnaissance Tool to Vector Future Exploration

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Diamonds are our window into the Earth and most of them have been blasted up to the surface by violent, gassy volcanic eruptions called kimberlites. Surprisingly, less than one percent of kimberlites are economic, so the development of optimal methods to vector future exploration is where my story begins. Luckily, in addition to diamonds, kimberlite also carries a variety of heavy minerals. The compositional characteristics of these minerals have been used frequently in diamond exploration, the bad news is that such methods require complex sampling procedures, expensive costs and most importantly they are not universally applicable. To address the issues, I will use my X-ray beam to bombard the crystals to collect their structural information. Because each of them has distinct structural fingerprints, my X-ray beam will return a unique signal, which in turn, can be utilized to classify the crystals and develop new exploration methods innovatively and cost effectively.