Metal flux reactions in lanthanide-rich eutectics such as La/Ni or Ce/Cu have yielded a variety of complex intermetallics that form as large crystals. We have found that carrying out flux reactions in the presence of anthracene (C_{14}H_{10}) results in the incorporation of both carbon and hydrogen into the growing products. While the position of carbon atoms can be determined using X-ray diffraction, neutron diffraction is crucial to locating and refining the positions of interstitial hydrides surrounded by heavy lanthanide atoms. Single crystal neutron diffraction data collected using the TOPAZ diffractometer at ORNL enabled the refinement of the hydride sites in La_{15}(FeC_{6})_{4}H, La_{3}BC_{2}H_{1.7}, and Ce_{4}B_{2}C_{2}H_{2.4}. We were also able to refine H/F mixing on a fluoride-substituted variant of Ce_{4}B_{2}C_{2}(H/F)_{x}.