The analysis of in-core reactor data using a combination of organic and inorganic scintillators is a challenging task that has never been done before. In this work, we present the calibration of inorganic CeBr3 detectors for gamma spectroscopy in the CROCUS zero-power reactor. To achieve this, we first recorded the spectrum of 152Eu with these CeBr3 detectors. 152Eu was chosen for calibration due to the abundance and wide energy range of its photopeaks. We subtracted the Compton continuum with linear fits for the photopeaks of interest (121, 244, 344, 779, 964, and 1408 keV) and fit Gaussian functions to the subtracted photopeaks. We compared the means of each peak (in pulse integral units of V-ns) with their expected values from literature (in keV). By fitting the means of these peaks to their known values, we derived a linear relation for calibrating the CeBr3 detectors. The fit had a strong positive correlation ($R2 = 0.9999$), meaning our data agreed well with the expectation that the pulse integral scales linearly with energy. In addition, the photopeaks from 152Eu provided insight into the energy resolution of these detectors. We found that the energy resolution at 662 keV was 6%, compared to the 5% quoted in the detectors' documentation. We applied this calibration to our CeBr3 detectors, and we measured in the reactor core to characterize the gamma background during shutdown. Our results demonstrate that the CeBr3 detectors can be reliably calibrated using 152Eu and conduct useful gamma spectroscopy for the CROCUS experiment. Future work will apply gamma spectroscopy conclusions to organic-scintillator gamma responses in CROCUS for reactor noise measurements.