Single crystals of the polytypic materials CdI₂, PbI₂, and CdBr₂, have been grown and purified by the method of zone-refining. The experimental set-up used for this purpose has been described. The crystals have been investigated by x-ray diffraction to know how the impurities influence the growth and polytypism of the crystals. Only the most stable small period polytypes have been found to exist in the three materials. The x-ray photographs have been found free from streaking and arcing, revealing absence of both random and ordered stacking faults in the crystals. Significant structural transformations have been observed in the PbI₂ crystals at room temperature. The results have been discussed in terms of creation and expansion of stacking faults.