# High resolution x-ray characterization of mosaic crystals for hard x- and gamma-ray astronomy

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For hard x-ray astronomy in the 70-1000 keV energy range Laue lenses have been proposed where the focusing elements are made of single mosaic crystals, in order to increase the diffraction efficiency with respect to perfect crystals.
Suitable crystals to be used for such application should have a sufficient density to increase the diffraction efficiency and a mosaicity ranging between 30 arcsec and 1-2 arcmin, depending on the lens focusing distance and resolution. In the past germanium and copper crystals, often employed as monochromators for neutrons, have been considered.
In this work we propose several crystalline materials of different degree of crystal perfection such as GaAs, Cu, CdTe, and CdZnTe as possible mosaic crystals for hard x-ray astronomy. They were analyzed by high resolution x-ray diffraction at 8 keV and by diffraction at energies up to 700 keV at synchrotron.
It was found that:
-CdTe and CdZnTe crystals exhibit low angle grain boundaries preventing the formation of a single diffracted x-ray beam;
-Cu crystals exhibit mosaicity of the order of several arcmin, however a deep etching is needed to remove the cutting damage;
-GaAs crystals grown by LEC method show mosaicity between 15 and 30 arcsec and good diffraction efficiency up to energies of 700 keV.
Annealing and surface damage were considered as possible methods to increase the GaAs crystal mosaicity.