the material can be removed by processes known for ductile metals. This is, however, a slow but moderate process.

With increasing pressure the material begins to break and cracks are generated parallel to the load axis emanating from the plastic zone. Median cracks are generated beneath the plastic zone, where the tensile stresses are maximal, in the form of full or truncated circles. At a critical size they become unstable and extend towards the surface. In addition, shallow radial cracks may be generated at the edges of the plastic zone. Both radial and median cracks may coalesce to form halfpenny-shaped cracks that are visible at the surface (as shown in Figure 6.19). Upon unloading, residual stresses from the elastic–plastic zone can lead to lateral cracks parallel to the surface. When these lateral cracks reach the surface, material is chipped away. This is the main process for material removal during sawing. Chipping requires a certain minimum load to occur (chipping threshold). Above the limit when material is removed only the median and radial cracks remain. They are finally part of the saw damage.

A quantitative model based on the rolling grain interaction described above has been developed. Results have been compared with experimental investigations of the sawing process on commercial multi-wire saws, allowing for the extraction of useful conclusions. Details can be found in Reference [40].

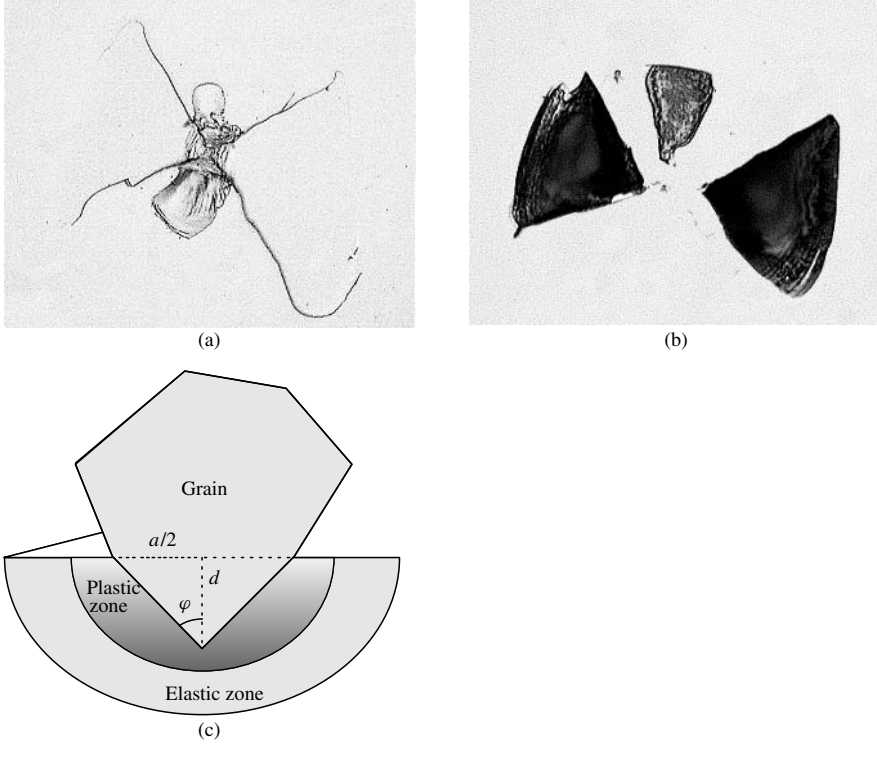

Figure 6.19 (a) Optical micrograph of median and (b) lateral cracks (below the surface) at a Vickers indentation. (c) Schematic representation of the impression of a sharp grain into a surface