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Compaction of siltstone using synchrotron x-ray diffraction

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We report new preliminary results that quantify the stress distribution within a siltstone (~65% quartz). The samples were probed with synchrotron X-ray diffraction as they were compressed in a multianvil deformation apparatus (APS 6BM-B) at room temperature from low pressure (tens of megapascal) to pressures of a few gigapascal. In such a rock core, stress is likely to concentrate at grain-to-grain contacts and vanish where grains are bounded by open porosity. Therefore, the internal stress is likely to vary significantly from point to point in such geomaterial, and hence, it is important to understand both the heterogeneity and anisotropy of such variation with respect to the externally applied stress. In our siltstone (grain size of ~2 μm), the measured diffraction peaks broaden at low pressure (tens of megapascal), suggesting that open pores are still a dominant characteristic of grain boundaries. Comparing to previous results on quartz aggregate (100% quartz) [Cheung et al., 2017], instead of continue broadening, siltstone appeared to yield beyond 120 tonns.