

On normal grain growth of alpha- and beta-quartz aggregate: an experimental study

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Annealing experiments on agate were performed to investigate the microstructural development on normal grain growth of quartz. The experiments were conducted using a piston-cylinder apparatus at alpha-quartz region (700 degree, confining pressures 1.0GPa) and beta-quartz region (700 and 800 degree, confining pressures 0.5GPa) for 0.5-66hr. In all samples, grain sizes of quartz increased from a few to a few tens of microns with time. Grain size distributions were fitted by log-normal distributions. In beta-quartz region, we found that orientations of the longest axes in individual grains tend to be parallel to the orientations of their c-axes. Since the agate has a primary crystal-preferred orientation (CPO) of c-axes, this appears to result in the development of shape-preferred orientation (SPO) during grain growth. Furthermore, our preliminary study indicates that alpha-quartz aggregates tend to grow distinctively faster than beta-quartz aggregates. Such normal grain growth of both alpha- and beta-quartz may be important for microstructural development of quartz-rich tectonite in a common P-T space at depth.