Numerical Simulation of the Evolution of Antitaxial Fibrous Veins

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We performed numerical simulations of natural antitaxial fibrous veins to gain insights into the sensitivity of the resulting texture to factors such as wall roughness, grain size, fracture opening velocity, crystal growth rate and growth anisotropy. Grain boundary attractors force grain boundaries to follow the opening trajectory, if the wall roughness is high, the crack-seal increments sufficiently small, and the growth rate large enough that crystals touch the wall before the next crack increment starts. Growth anisotropy and initial grain size are only of minor importance for the tracking capability of grain boundaries in the vein. For crack increments below a critical value no effect on the resulting fibrous microstructure can be observed, so both discontinuous and continuous accretion processes can produce fibres with tracking capability. On the other hand, the fibrous texture itself is no indicator for the tracking capability of its grain boundaries. SEM observations on natural antitaxial vein walls indicate that the two sides are not imprints of each other. This suggests deformation of the wall during vein growth.

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