Textural development in experimental shear zones using analogue materials

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The use of soft organic materials as rock analogues has become popular in the study of rock deformation. Their low strength and relatively low melting temperature allow ductile deformation experiments to be conducted at elevated strain rates and high homologous temperatures thus permitting *in situ* observations to be made of fabric development in the resulting shear zones.

The experimental procedure used here is to deform paradichlorobenzene ($C_6H_4Cl_2$) at room temperature in a shear zone situated between two microscope slides. The samples are deformed in a Urai press that is attached to a microscope stage. The deformation is viewed microscopically and is recorded either by still or time lapse photography. The deformation takes place in a shear zone approximately 3 mm wide and at a strain rate of approximately 10^{-5} s^{-1} . At room temperature paradichlorobenzene (PDCB) is at homologous temperature in excess of 0.9.

The original PDCB igneous texture of coarse acicular grains evolves throughout the deformation until a steady-state dynamically recrystallized S-C fabric is attained. The modification of the original texture starts with kinkband formation and is dominated by kink band and grain boundary migration processes. Strongly distorted grains are preferentially consumed by the migration of adjacent grain boundaries of subgrain-free grains into grains with subgrains. Although lacking crystallographic orientation information, these observations appear to demonstrate the evolution of a steady-state foliation. Once an apparent steady-state grain size has been achieved, the surviving neoblasts show little subgrain development. The sample continues to accumulate strain through the progressive rotation of the foliation towards the shear plane with much of the flattening accommodated by the movement of grains along grain boundaries. The strain is considerably more heterogeneous than the resulting microstructure.