**PhD/Postdoctoral position in phase-field modeling of polycrystalline evolution in geological veins**

GEOLAB, a joint initiative of the Karlsruhe Institute of Technology (KIT, Karlsruhe), Helmholtz centers for Environmental Research (UFZ) and Geosciences (GFZ, Potsdam) invite applications for a PhD/Postdoc candidate position (Salary scale TV-L E13).

The qualifying candidate will join a young, dynamic, international team of multidisciplinary scientists engaged in numerous scientific and industrial cooperations under the leadership of Prof. Dr. rer. nat. Britta Nestler (at Institute of Applied Materials, KIT). The Computational Materials Science group at IAM specializes in the application of phase-field methods for grain structure evolution at the mesoscale in commercial alloys and geomaterials.

The PhD student/postdoc is expected to conduct large scale numerical studies of the polycrystalline evolutions in geological veins. This work will be based on the extension of concepts proposed in:


During the initial stages, the appointed candidate will directly report to the team leader (Group name: Quantitative modeling of phase transformations).

**Brief overview of the project**

Progressive crack-sealing is the most common vein forming process in Earth’s crust but the details of the microstructural processes in these are not well understood. One important facet of vein growth processes is the crystallization of minerals (for e.g. quartz, calcite) from a supersaturated solution in crevice within rocks. The system examined in the present project consists of a gap between two walls of polycrystalline material, filled with a supersaturated solution with a pressure gradient. From this fluid, crystals precipitate epitaxially on the crystal of the surrounding rock. Such a system is intrinsically complex as the convection influences the polycrystalline evolution and the growth competition between the crystals. Additionally, the hydrodynamic conditions are influenced by the sealing and reopening of the gap. A new and promising interdisciplinary model approach for the problem of vein growth is the method of phase-field modeling coupled with hydrodynamic calculations. An exemplary work-flow to numerically model the vein growth process in rocks is illustrated underneath:
The overall objective of the proposed project is to develop a thorough understanding of the thermo-hydro-mechanical-chemical processes in veins using state-of-the-art phase-field model that can potentially assist in oil exploration.

**Minimum Job Requirements:**

- For PhD candidate: Masters degree or equivalent in computer or mechanical engineering, materials science, geophysics, or a related field. As per the official guidelines, the candidates need to figure in top 50% of the graduating class (during Masters or equivalent) for a successful registration as doctoral student at KIT.

- For Postdoc: An excellent track-record of publication in peer-reviewed journals.

**The appointed candidate is expected to commence work by January, 2016.**

**Desired qualities**

- Basic understanding of phase transformation in materials and thermodynamics.
- Preference will be given to candidates having a working knowledge of the phase-field method. Candidates having experience with cellular automata or atomistic-scale simulations are also encouraged to apply.
- Keen interest in computer programming (C/C++) and knowledge of numerical techniques.
- Demonstrated capabilities in parallel code development is a plus.
- Ability to work in a collaborative research environment on problems comprising diverse application domains.
- Excellent written and oral communication skills (English).

**How to apply**

Interested candidates should send an updated CV and the contact information of at least 3 references to Kumar Ankit (Team Leader): kumar.ankit@kit.edu.

In case of further queries, please feel free to contact me or Prof. Dr. Britta Nestler (britta.nestler@kit.edu).

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