Challenging computations in complicated materials

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Abstract:

This minisymposium brings together researchers in material modeling, numerical PDEs, scientific computing, engineering, and other fields with the greatest common divisor being numerical solution of challenging problems in modeling of complicated materials.

The challenges can be of two main types, and it is not uncommon that they come hand in hand. First, the physical models of real-world phenomena often require complicated and complex description in terms of the used constitutive relations describing the mechanical, thermal, chemical properties of the involved materials and mutual relations between these processes. Often the materials also cannot be described by single continuum models, but a more involved multi-component (mixture) approach must be adopted.

Second, substantial numerical difficulties often appear when it comes to solving large (linear or nonlinear) algebraic systems arising from numerical discretization of the systems of PDEs describing the initial boundary value problems associated with the modelled physical phenomena. These difficulties often call for involved tools of numerical linear algebra, special preconditioning techniques, etc.