A stability analysis of the Stokes interface problem with locally modified finite elements

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We consider and analyze a stationary Stokes interface problem on anisotropic meshes. For the discretization we apply locally modified finite elements of second order in the velocity and piecewise constants for the pressure. A motivation of this work is to show an inf-sup condition for the discrete Stokes problem that does not depend on the interface position. Our results show that we need to use a stabilization only in very special and rare cases, where neighboring elements are cut by the interface in a specific configuration. Furthemore, we prove optimal error estimates in the L^2-norm and sub-optimal estimates in an energy norm for Stokes problems. Also we present numerical examples to substantiate the analytical results.

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