Reduction of the plasticity model to to an operator equation and regularity

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We show that the model equations of plasticity and viscoplasticity, which use internal variables to model history dependent material behavior, can be reduced to an evolution equation with a nonlinear monotone evolution operator. Based on standard properties of this evolution equation we prove interior and boundary regularity of the solutions. The most interesting part is the investigation of the boundary regularity, since one cannot apply the standard method to prove regularity of the tangential derivatives and subsequentially extend this result to the normal derivatives by solving the equations for this derivative. Accordingly, one can show that the stress field belongs to $H^{1,\mathrm{loc}}$, but at the boundary one only gets $H^{1/2-\varepsilon}$–regularity. Recently this result could be improved in [3] to $H^{1/2+\varepsilon}$.

The talk is based on joint work with S. Nesenenko.

References

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