

**Kasri, Abderrezak**

**A frictional contact problem with damage in viscoplasticity.** (English) Zbl 1457.74032  
Sib. Elektron. Mat. Izv. 18, 255-281 (2021).

Summary: In this paper, we study a quasistatic contact problem with damage between a viscoplastic body and an obstacle the so-called foundation. The contact is modelled with a general normal compliance condition and the associated version of Coulomb's law of dry friction. We provide a variational formulation of the mechanical problem for which we establish an existence theorem of a weak solution including a regularity result.

**MSC:**

- 74C10 Small-strain, rate-dependent theories of plasticity (including theories of viscoplasticity)
- 49J40 Variational inequalities
- 74A55 Theories of friction (tribology)
- 74H20 Existence of solutions of dynamical problems in solid mechanics
- 74M15 Contact in solid mechanics

**Keywords:**

viscoplastic material; damage; Coulomb's law of dry friction; normal compliance; quasistatic; Rothe method; variational inequalities

**Full Text:** [DOI](#)

**References:**

- [1] V. Barbu, Optimal control of variational inequalities, Research Notes in Mathematics, 100, Pitman, Boston etc., 1984. Zbl 0574.49005 · [Zbl 0574.49005](#)
- [2] H. Brezis, Functional analysis, Sobolev spaces and partial differential equations, Springer, New York, 2011. Zbl 1220.46002 · [Zbl 1220.46002](#)
- [3] M. Campo, J.R. Fernandez, T.-V. Hoarau-Mantel, Analysis of two frictional viscoplastic contact problems with damage, J. Comput. Appl. Math., 196:1 (2006), 180197. Zbl 1095.74022 · [Zbl 1095.74022](#)
- [4] N. Cristescu, I. Suliciu, Viscoplasticity, Martinus Nijho Publishers, Editura Tehnica, Bucharest, 1982. Zbl 0514.73022
- [5] G. Duvaut, J.L. Lions, Inequalities in mechanics and physics, Grundlehren der Mathematischen Wissenschaften, 219, Springer-Verlag, Berlin etc., 1976. Zbl 331.35002
- [6] E. Emmrich, Discrete versions of Gronwall's lemma and their application to the numerical analysis of parabolic problems, TU Berlin, Fachbereich Mathematik, Preprint, 637, 1999.
- [7] J.R. Fernandez, M. Sofonea, Variational and numerical analysis of the Signorini's contact problem in viscoplasticity with damage, J. Appl. Math., 2003:2 (2003), 87114. Zbl 1064.74134 · [Zbl 1064.74134](#)
- [8] M. Fremond, B. Nedjar, Damage in concrete: the unilateral phenomenon, Nuclear Engng. Design, 156:1-2 (1995), 323335.
- [9] M. Fremond, B. Nedjar, Damage, gradient of damage and principle of virtual power, Int. J. Solids Struct., 33:8 (1996), 10831103. Zbl 0910.73051 · [Zbl 0910.73051](#)
- [10] J. Han, S. Migorski, A quasistatic viscoelastic frictional contact problem with multivalued normal compliance, unilateral constraint and material damage, J. Math. Anal. Appl., 443:1 (2016), 5780. Zbl 1433.74082 · [Zbl 1433.74082](#)
- [11] W. Han, M. Sofonea, Quasistatic contact problems in viscoelasticity and viscoplasticity, AMS, Providence, 2002. Zbl 1013.74001 · [Zbl 1013.74001](#)
- [12] A. Kasri, A viscoplastic contact problem with friction and adhesion, Sib. Electron. Math. Izv., 17 (2020), 540565. Zbl 1434.74034 · [Zbl 1434.74034](#)
- [13] A. Kasri, A. Touzaline, A quasistatic frictional contact problem for viscoelastic materials with long memory, Georgian Math. J., 27:2 (2020), 249264. Zbl 1440.49010 · [Zbl 1440.49010](#)
- [14] A. Kasri, A. Touzaline, Analysis of a dynamic contact problem with friction, damage and adhesion, Appl. Math., 46:1 (2019), 127153. Zbl 07087834 · [Zbl 07087834](#)
- [15] A. Klarbring, A. Mikelic, M. Shillor, Frictional contact problems with normal compliance, Int. J. Eng. Sci., 26:8 (1988), 811832. Zbl 0662.73079 · [Zbl 0662.73079](#)
- [16] Y. Li, S. Migorski, J. Han, A quasistatic frictional contact problem with damage involving viscoelastic materials with short

memory, *Math. Mech. Solids*, 21:10 (2016), 11671183. Zbl 1370.74117 · [Zbl 1370.74117](#)

- [17] J.A.C. Martins, J.T. Oden, Existence and uniqueness results for dynamic contact problems with nonlinear normal and friction interface law, *Nonlinear Anal., Theory Methods Appl.*, 11:3 (1987), 407428. Zbl 0679.73050 · [Zbl 0672.73079](#)
- [18] J. Necas, I. Hlavacek, *Mathematical theory of elastic and elasto-plastic bodies: an introduction*, Studies in Applied Mechanics, 3, Elsevier, Amsterdam etc., 1981. Zbl 0448.73009 · [Zbl 0448.73009](#)
- [19] P.D. Panagiotopoulos, *Inequality problems in mechanics and applications. Convex and nonconvex energy functions*, Birkhauser, Boston etc., 1985. Zbl 0579.73014 · [Zbl 0579.73014](#)
- [20] E. Roth, Zweidimensionale parabolische Randwertaufgaben als Grenzfall eindimensionaler Randwertaufgaben, *Math. Ann.*, 102 (1930), 650670. JFM 56.1076.02 · [Zbl 56.1076.02](#)
- [21] M. Rudd, K. Schmitt, Variational inequalities of elliptic and parabolic type, *Taiwanese J. Math.*, 6:3 (2002), 287322. Zbl 1330.35227 · [Zbl 1330.35227](#)
- [22] M. Shillor, M. Sofonea, J.J. Telega, *Models and analysis of quasistatic contact. Variational methods*, Lecture Notes in Physics, 655, Springer, Berlin, 2004. Zbl 1069.74001 · [Zbl 1069.74001](#)
- [23] M. Sofonea, M. Shillor, Variational analysis of a quasistatic viscoplastic contact problem with friction, *Commun. Appl. Anal.* 5:1 (2001), 135151. Zbl 1084 · [Zbl 1084.74541](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.