A BLOW-UP RESULT IN A NONLINEAR VISCOELASTIC PROBLEM WITH ARBITRARY POSITIVE INITIAL ENERGY

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Abstract. In this paper we consider a problem for a nonlinear viscoelastic wave equation. Under arbitrary positive initial energy and standared conditions on the relaxation function, we prove a finite-time blow-up result.

Keywords. Blow up, nonlinear wave, viscoelastic, finite time.

AMS (MOS) subject classification:35B05, 35L05, 35L15, 35L70

References

[1] A. B. Al'shin, O. M. Korpusov, and A. G. Sveshnikpov, Blow-up in nonlinear Sobolev type equations, *De Gruyter series in nonlinear analysis and applications,* **15,** (2011).

[2] J. Ball, Remarks on blow up and nonexistence theorems for nonlinear evolutions equations, *Quart. J. Math. Oxford,* **28,** (1977) 473-486.

[3] M. M. Cavalcanti, V. N. Domingos Cavalcanti and J. Ferreira, Existence and uniform decay for nonlinear viscoelastic equation with strong damping, *Math. Meth. Appl. Sci.*, **24,** (2001) 1043-1053.

[4] V. Georgiev and G. Todorova, Existence of solutions of the wave equation with nonlinear damping and source terms, *J. Diff. Eqs*, **109,** (1994) 295-308.

[5] H. Geng and J. Ma, Globa nonexistence of arbitrary initial energy solutions of viscoelastic equation with nonlocal boundary damping, *Taiwanese Journal of Mathematics,* **16**, No. 6, (2012) 2019-2033.

[6] M. Jie, C. Mu and R. Zeng, A blow up result for viscoelastic equations with arbitrary positive initial energy, *Boundary Value Problems,***6**, (2011).

[7] M. Kafini and S. Messaoudi, A blow-up result for a viscoelastic system in $\mathbb{R}^N$, *Elect. J. Diff. Eqs.*, **113,** (2006) 1-7.

[8] O. M. Korpusov, Non-existence of global solutions to generalized dissipative Klein-Gordon equations with positive energy, *Elect. J.Diff. Eqs.,* **119,** (2012) 1-10.

[9] H. A. Levine, Instability and nonexistence of global solutions of nonlinear wave equation of the form $Pu_{tt} = Au + F(u)$, *Trans. Amer. Math. Soc.*, **192,** (1974) 1-21.

[10] H. A. Levine, Some additional remarks on the nonexistence of global solutions to nonlinear wave equation, *SIAM J. Math. Anal.*, **5,** (1974) 138-146.

[11] H. A. Levine and J. Serrin, A global nonexistence theorem for quasilinear evolution equation with dissipation, *Arch. Rational Mech. Anal.* **137** (1997), 341-361.

[12] H. A. Levine, S. Ro, Park and J. Serrin, Global existence and global nonexistence of solutions of the Cauchy problem for a nonlinearly damped wave equation, *J. Math. Anal. Appl.,* **228,** (1998) 181-205.

[13] S. A. Messaoudi, Blow up in a nonlinearly damped wave equation, *Mathematische Nachrichten,* **231,** (2001) 1-7.

[14] S.A. Messaoudi and B. Said-Houari, Blow up of solutions of a class of wave equations with nonlinear damping and source terms, *Math. Methods Appl. Sci.,* **27,** (2004) 1687-1696.

[15] S. A. Messaoudi, Blow up and global existence in a nonlinear viscoelastic wave equation, *Mathematische Nachrichten,* **260,** (2003) 58-66.

[16] S. A. Messaoudi, Blow up of solutions with positive initial energy in a nonlinear viscoelastic equation, *J. Math. Anal. Appl.,* **320,** (2006) 902-915.

[17] S. A. Messaoudi, Blow up in the Cauchy problem for a nonlinearly damped wave equation, *Comm. On Applied. Analysis,* **3,** (2003) 379-386.

[18] L. Shengjia, H. Fengb, and M. Wub, *Nonlinear Analysis: Theory, Methods & Applications,* **75**, (2012) 5653–5663.

[19] W. Shun-Tang, Blow-up results for systems of nonlinear Klein-Gordon equations with arbitrary positive initial energy, *Electronic Journal of Differential Equations,* **92**, (2012) 1-13.

[20] G. Todorova, Cauchy problem for a nonlinear wave with nonlinear damping and source terms, *C. R. Acad. Sci. Paris Ser. I,* **326,** (1998) 191-196.

[**21**] G. Todorova, Stable and unstable sets for the Cauchy problem for a nonlinear wave with nonlinear damping and source terms, *J. Math. Anal. Appl.*, **239,** (1999) 213-226.

[**22**] E. Vitillaro, Global nonexistence theorems for a class of evolution equations with dissipation, *Arch. Rational Mech. Anal.,* **149,** (1999) 155-182.

[**23**] S. T. Wu, Blow-up of solutions for an integro-differential equation with a nonlinear source, *Elect. J. Diff. Eqs.,* **45** (2006) 1-9.

[**24**] Y. Zhou, A blow-up result for a nonlinear wave equation with damping and vanishing initial energy in $\mathbb{R}^N$, *Applied Math Letters,* **18,** (2005) 281-286.

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