Book of Abstracts

11th Workshop Dynamic Behaviour of Materials and its Applications in Industrial Processes

23-25 August 2017

Universidade do Minho, Portugal

Edited by:

Nuno PEIXINHO

Guimarães 2017

Editor: Nuno PEIXINHO

Financial support: DYMAT

The abstracts have been produced from the electronic material supplied by the Authors without amendments by Editors

ISBN 978-972-99596-3-9

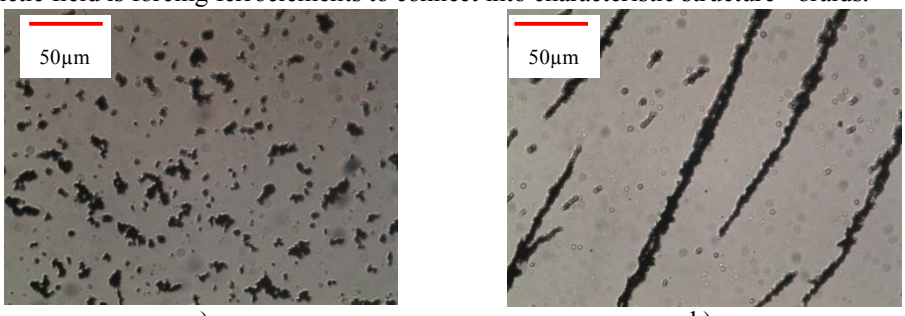
DYNAMIC BEHAVIOUR OF MAGNETHOREOLOGICAL MATERIALS

L. J. Fras, R.B. Pecherski

Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland

Abstract

The magnethoreological material is based on the ferroparticles immersed in carring fluid. The acting magnetic field is forcing ferroelements to connect into characteristic structure - braids.



a) b)

Fig. 1: The ferroelements in a neutral state (a) and under the influence of magnetic field (b).

Behaviour of the magnethoreological material at the high strain rates will be described by Perzyna model [1]:

$$\dot{\varepsilon} = \frac{\dot{\sigma}}{E} + \gamma\langle\Phi[\sigma - f(\varepsilon)]\rangle \qquad 1)$$

where:

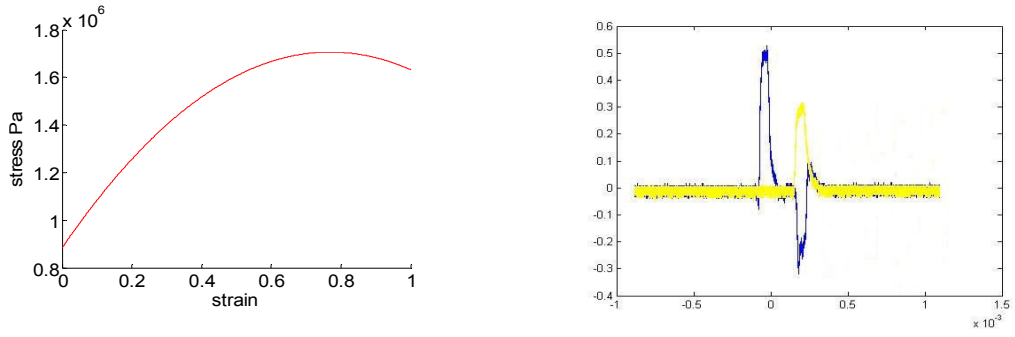
ε: total nominal strain — γ: viscosity parameter

E: Young modulus — $\sigma = f(\varepsilon)$ is material characteristic for quasi-statical test

The symbol Φ describes the excess stress function:

$$\langle\Phi\rangle = \begin{cases} \Phi, & \text{when } \sigma > f(\varepsilon) \\ 0, & \text{when } \sigma \leq f(\varepsilon) \end{cases} \qquad 2)$$

The created model will be verified with use of dedicated laboratory set up.



a) b)

Fig. 2: The experimental results of magnethoreological *material obtained with use of the Split Hopkinson Pressure Bar(a), the waveform (b).*

References:

[1] Perzyna P. *The constitutive equations for rate sensitive plastic materials.* Quarterly of Applied Mathematics, Vol. XX, No. 4, 321-332. 1963 January.

Acknowledgment
This work was supported by the NCN (National Science Centre) Research Project: UMO-2O15/17/N/ST8/02018.

Authors:

Leszek J. Fras
e-mail lfras@ippt.pan.pl, tel.: +48-22 826 12 81 ext.260

Ryszard B. Pecherski
e-mail address: rpecher@ippt.pan.pl, tel.: +48-22 826 12 81ext. 210