IJG> Vol.2 No.3, August 2011

OPEN ACCESS

The Effect of Micro-Structure on Fatigue Behaviour of Intact Sandstone

PDF (Size:966KB) PP. 240-247 DOI: 10.4236/ijg.2011.23026

Author(s)

Manoj N. Bagde, Vladimir Petroš

ABSTRACT

With advent of servo-controlled stiff testing machines, it is now possible to conduct tests on a rock in the laboratory under different variable controlled conditions. In this paper, cyclic fatigue behaviour of intact sandstone obtained from the rock burst prone coal mine in the Czech Republic were presented. Tests were conducted on MTS- 816 rock test system in the laboratory on intact rock samples of L/D ratio 2 under cyclic loading frequency of 0.1, 1, 3, 5, 7 and 10 Hz at amplitude of 0.1 mm under displacement control mode until failure of the samples in uni-axial compression. From, the primary results it was observed that at low loading frequency range of 0.1 to 3 Hz, there was degradation of the rock samples in terms of fatigue strength and modulus. While, at higher frequency rose-up in strength and deformation properties were observed. It was observed that the machine behaviour in terms of amplitude at higher loading frequencies might be affecting the results. It seemed that machine behaviour of servo-hydraulic testing system was also dependent on rock type under investigation.

KEYWORDS

Cyclic Loading, Fatigue, Micro-Structure, Machine Behaviour, Rock Memory

Cite this paper

M. Bagde and V. Petroš, "The Effect of Micro-Structure on Fatigue Behaviour of Intact Sandstone," *International Journal of Geosciences*, Vol. 2 No. 3, 2011, pp. 240-247. doi: 10.4236/ijg.2011.23026.

References

[1] N. T. Burdine, "Rock Failure under Dynamic Loading Conditions," Society of Petroleum Engineers, Vol. 3, No. 1, 1963, pp. 1-8. doi:10.2118/481-PA

[2] H. R. Hardy and Y. P., Chugh "Failure of Geologic Materials under Low-Cycle Fatigue," Proceeding of 6th Canadian Symposium on Rock Mechanics, Montreal, 1970, pp. 33-47.

[3] B. C. Haimson and C. M. Kim, "Mechanical Behaviour of Rock under Cyclic Fatigue. Stability of Rock Slopes," Proceeding of 13th Symposium on Rock Mechanics, Urbana, 30 August-1 September 1971, pp. 845-863.

[4] P. B. Attewell and I. W. Farmer, "Fatigue Behaviour of Rock." International Journal of Rock Mechanics and Mining Sciences & Geomechanics Abstracts, Vol. 10, No. 1, 1973, pp. 1-9. doi:10.1016/0148-9062(73)90055-7

[5] M. N. Bagde and V. Petros, "Fatigue Properties of Intact Sandstone Samples Subjected to Dynamic Uniaxial Cyclical Loading," International Journal of Rock Mechanics and Mining Sciences, Vol. 42, No. 2, 2005, pp. 237-250. doi:10.1016/j.ijrmms.2004.08.008

[6] M. N. Bagde and V. Petros, "Waveform Effect on Fatigue Properties of Intact Sandstone in Uniaxial Cyclic Loading," Rock Mechanics and Rock Engineering, Vol. 38, No. 3, 2005, pp. 169-196. doi:10.1007/s00603-005-0045-

[7] M. N. Bagde and V. Petros, "The Effect of Machine Behaviour and Mechanical Properties of Intact Sandstone under Static and Dynamic Uniaxial Cyclic Loading," Rock Mechanics and Rock Engineering,

• Open Special Issues
• Published Special Issues
• Special Issues Guideline

IJG Subscription

Most popular papers in IJG

About IJG News

Frequently Asked Questions

Recommend to Peers

Recommend to Library

Contact Us

Vol. 38, No. 1, 2005, pp. 59-67. doi:10.1007/s00603-004-0038-z

[8] M. N. Bagde and V. Petros, "Fatigue and Dynamic Energy Behavior of Rock Subjected to Cyclical Loading," International Journal of Rock Mechanics and Mining Sciences, Vol. 46, No. 1, 2009, pp. 200-209. doi:10.1016/j.ijrmms.2008.05.002

[9] C. D. Martin and N. A. Chandler, "The Progressive Fracture of Lac du Bonnet Granite," International Journal of Rock Mechanics and Mining Sciences & Geomechanics Abstracts, Vol. 31, No. 6, 1994, pp. 643-659. doi:10.1016/0148-9062(94)90005-1

[10] S. S. Peng, "Time Dependent Aspects of Rock Behaviour as Measured by a Servocontrolled Hydraulic Testing Machine," International Journal of Rock Mechanics and Mining Sciences & Geomechanics Abstracts, Vol. 10, No. 3, 1973, pp. 235-246. doi:10.1016/0148-9062(73)90033-8

[11] N. Li, P. Zhang, Y. Chen and G. Swoboda, "Fatigue Properties of a Cracked, Saturated and Frozen Sandstone Samples under Cyclic Loading," International Journal of Rock Mechanics and Mining Sciences, Vol. 40, No. 1, 2003, pp. 145-150. doi:10.1016/S1365-1609(02)00111-9

[12] J. Hele?ic, Personnel Communication. 2003.

[13] A. N. Stavrogin and B. G. Tarasov, "Experimental Physics and Rock Mechanics," Balkema, Rotterdam. 2001, 356p.

[14] G. Brauner, "Rockbursts in Coal Mines and Their Prevention," Balkema, Rotterdam, 1994, p. 144.

[15] Y. L. Filimonov, A. V. Lavrov, Y. M. Shafarenko and V. L. Shkuratnik, "Memory Effects in Rock Salt under Triaxial Stress State and Their Use for Stress Measurement in a Rock Mass," Rock Mechanics and Rock Engineering, Vol. 34, No. 4, 2001,pp. 275-291. doi:10.1007/s006030170002