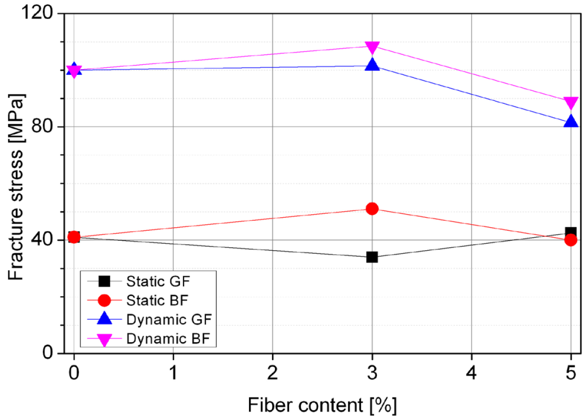

Fig. 2. Influence of glass (GF) and basalt fibers (BF) on the fracture strain at quasi-static and dynamic loading conditions.

2. Influence of the fiber content on the static and dynamic fracture stress

The fracture stress obtained during compression tests of matrix and fiber reinforced material as well is presented in Fig. 1. It may be observed that increase of the applied deformation rate induces clearly observed rise of the fracture stress in all cases. Analysis of the optimal content of fiber reinforcement in the concrete are shown in Fig. 2. Introducing of the 3% or 5% content of the glass fibers into concrete does not influence significantly fracture stress in the dynamic deformation regime. Under dynamic loading conditions 3% of the glass fibers reinforcement does not affect fracture stress, however further increase of the fibers share in the concrete up to 5% results in clearly observed drop of fracture stress, from 100 MPa to 80 MPa, in comparison to plain concrete. Application of 3% content of the basalt fiber induces increase of the fracture stress in both static and dynamic loading conditions. The fracture stress of the FRC concrete is 20 – 30 MPa higher then PC. Higher amount of the basalt fiber, i.e. 5% reduces fracture stress. For the static deformation rates stress of the 5% FRC drops to this same value as for the PC, whereas at the dynamic range the softening effect is even stronger, since the fracture stress drops to 90 MPa in comparison to 100 MPa for the PC.

3. Conclusions

Content of the glass fibers in the concrete does not influence the fracture stress at static loading conditions in a clearly observed way. Moreover at dynamic range 5% content of the fiber results in a significant drop of fracture stress. Analysis of the basalt fibers influence on the fracture stress shows that optimal content of this reinforcement is equal to 3% for both static and dynamic loading conditions. Further increase of the fiber share gives the opposite effect, i.e. drop of the fracture stress.

References

1. P. Baruah, S. Talukdar (2007). A comparative study of compressive, flexural, tensile and shear strength of concrete with fibres of different origins, *Indian Concrete Journal*, **81**, 17–24.
2. W. Mocko, Z.L. Kowalewski (2011). Dynamic Compression Tests – Current Achievements and Future Development, *Engineering Transactions*, **59**, 235–248.
3. L. Kruszka, W.K. Nowacki (1996). New applications of the Hopkinson pressure bar technique to determining dynamic behavior of materials, *Journal of Theoretical and Applied Mechanics*, **34**, 259–280.