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## CONFERENCE PROGRAMME



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## TI-BETA ALLOY - GUM METAL AND TINI SHAPE MEMORY ALLOY SUBJECTED TO COMPRESSION LOADING IN WIDE RANGE OF THE STRAIN RATES

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Multifunctional B-Ti alloy named Gum Metal, developed by the Toyota Central Research and Development Laboratories at the beginning of the 21st century, was compared to TiNi Shape Memory Alloy (SMA). To this end, the samples of both Ti alloys were subjected to compression test conducted at various strain rates. Gum Metal is characterized for the unique mechanical performance; low Young's modulus, large nonlinear recoverable deformation, and high strength [1-3]. In turn, TiNi SMA is well known material for the shape memory properties and high fatigue performance. Understanding of mechanical behaviour of the both Ti alloys subjected to loading at various strain rates is critical for its application.

The research concerns investigation of Gum Metal and TiNi SMA in compression under quasi-static and dynamic loadings. An MTS testing machine was used to measure the quasi-static behaviour of the alloys with strain rates 10<sup>-3</sup> s<sup>-1</sup> and 100 s<sup>-1</sup>. High strain rate uniaxial testing was performed using a Split Hopkinson Pressure Bar (SHPB) system obtaining strain rates of 940, 1460 and 2200 s<sup>-1</sup>. Cylindrical material samples of 5 mm x 5 mm were used. It was found that both Gum Metal, as well as TiNi SMA are very sensitive to the strain rate applied during the compression loading. Elastic-plastic transition during quasi-static compression of the Gum Metal appears at the stress level between 900 MPa and 1000 MPa, whereas under high strain rate loading condition the peak flow stresses are on the level between 1200-1400 MPa. Moreover, almost no strain hardening is observed for the strain rate of 10<sup>-3</sup> s<sup>-1</sup>. Strain softening is also visible for the strain rate of 100 s<sup>-1</sup>, as well as for high strain rate range.

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### References

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