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Ozerov M.S., Sokolovsky V. S., Stepanov N.D., Zherebtsov S.V. EFFECT OF HARDENING WITH BORIDES ON THE MICROSTRUCTURE AND MECHANICAL PROPERTIES OF $Al_5Nb_{24}Ti_{40}V_5Zr_{26}$ ALLOY-BASED COMPOSITES

The aim: Investigation of microstructure and mechanical properties of $Al_5Nb_{24}Ti_{40}V_5Zr_{26}$ high entropy alloy-based metal-matrix composites with different amounts of TiB_2 (1, 2 and 3 wt. %) obtained by vacuum arc melting process

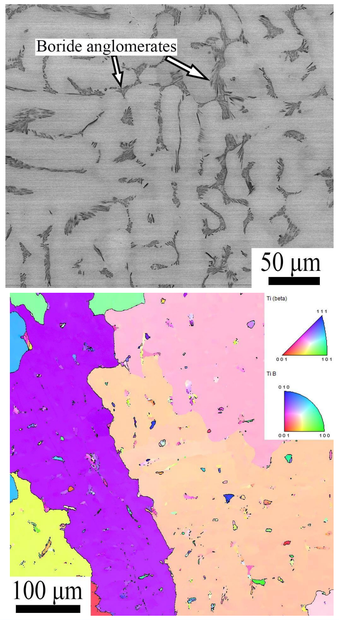
Method of obtaining

Vacuum arc remelting

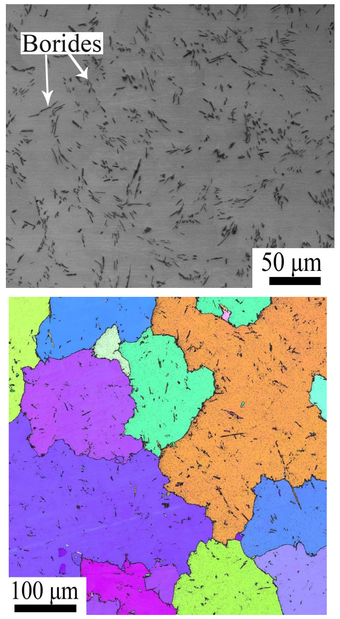
Buehler Arc Melter 200 (Germany)

Microstructure

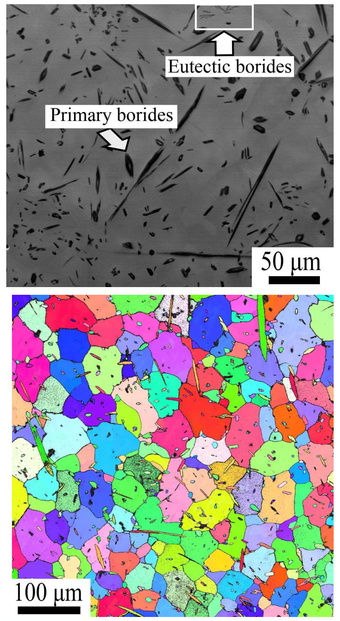
TiNbZr – 1 % wt. TiB_2



TiNbZr – 2 % wt. TiB_2

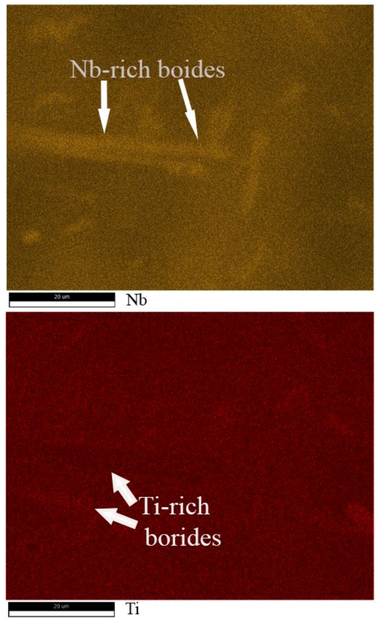


TiNbZr – 3 % wt. TiB_2



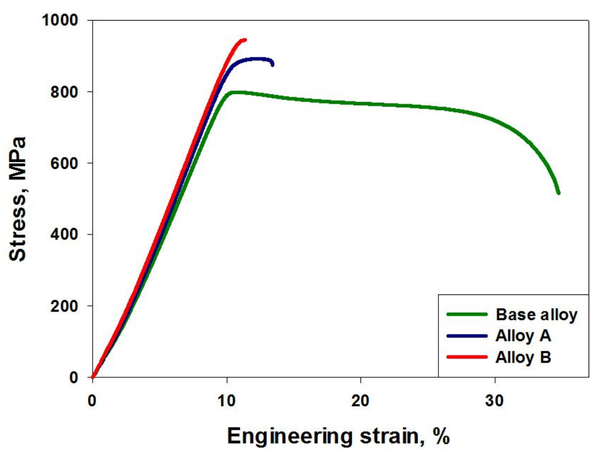
Mapping

(Ti, Nb) B particles



Mechanical properties

Tensile testing at room temperature



Composites	Yield strength, MPa	δ,%
Base $Al_5Nb_{24}Ti_{40}V_5Zr_{26}$ alloy	760	29
TiNbZr – 1 % wt. TiB2	840	5
TiNbZr – 2 % wt. TiB2	890	0.5
TiNbZr – 3 % wt. TiB2	900	0

Conclusions

- The as-cast structures of the $Al_5Nb_{24}Ti_{40}V_5Zr_{26}$ high entropy alloy-based composites with 1, 2, and 3 wt. % of TiB_2 was composed of bcc matrix and (Ti, Nb) B needle-like borides with the average thickness of 0.3, 0.9 and 1.8 μm, respectively.
- A significant refinement of the bcc grain size was found with an increase in the proportion of borides;
- Alloying the base alloy $Al_5Nb_{24}Ti_{40}V_5Zr_{26}$ with 1 % wt. TiB_2 increased the strength of the composite by 10 % while maintaining reasonable ductility of 5 %.

Acknowledgment

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