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Mechanical and tribological evaluation of a biomedical high-entropy alloy reinforced with TiC and TiB

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INTRODUCTION & AIM

This study aimed to synthesize, for the first time, a novel biomaterial composed by a HEA matrix (TiNbZrTaMo) and in-situ formed TiB and TiC reinforcements from the B4C powder added during the argon arc-melting. The main findings were discussed, considering the prospects for using it as a biomedical implant.

METHOD

Table 1
Chemical proportion of the raw metals used to form the HEA matrix.

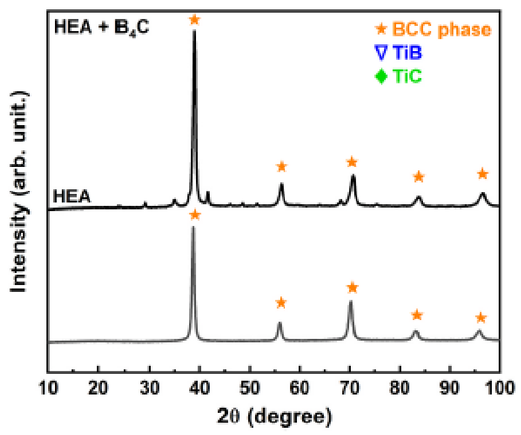
HEA sample		Ti	Nb	Zr	Ta	Mo
TiNbZrTaMo	At.%	20.00	20.00	20.00	20.00	20.00
	wt.%	9.41	17.93	18.26	35.56	18.86

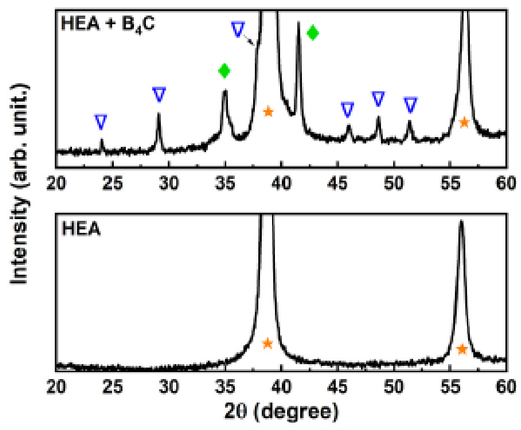
Arc-melting → HEA ingot → B4C powder

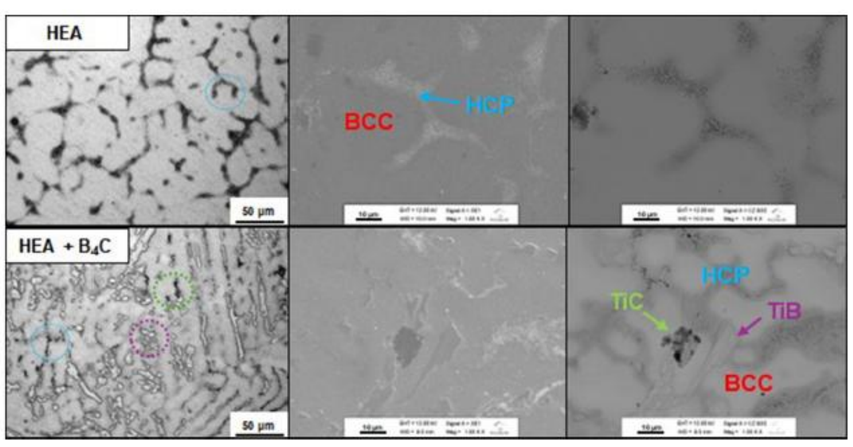
Characterization → XRD → SEM/EDS → TEM/SAED

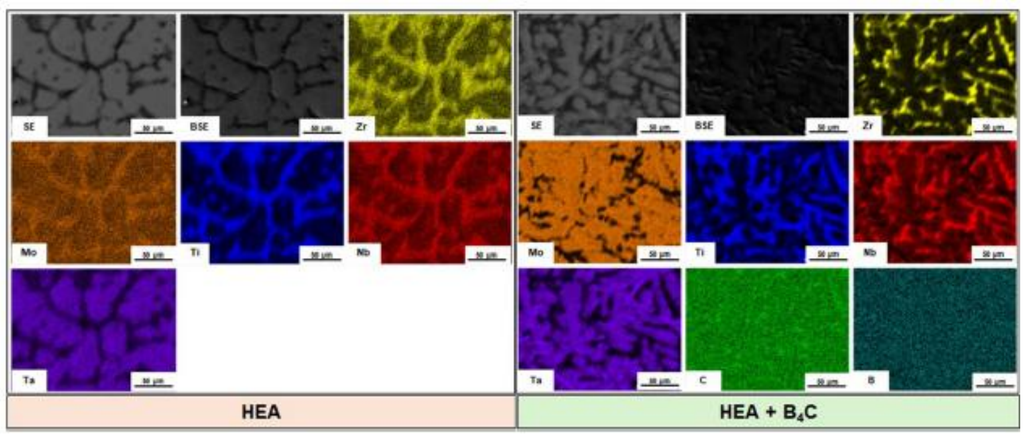
Testing → HV and E → Wear → MTT and CV

RESULTS & DISCUSSION









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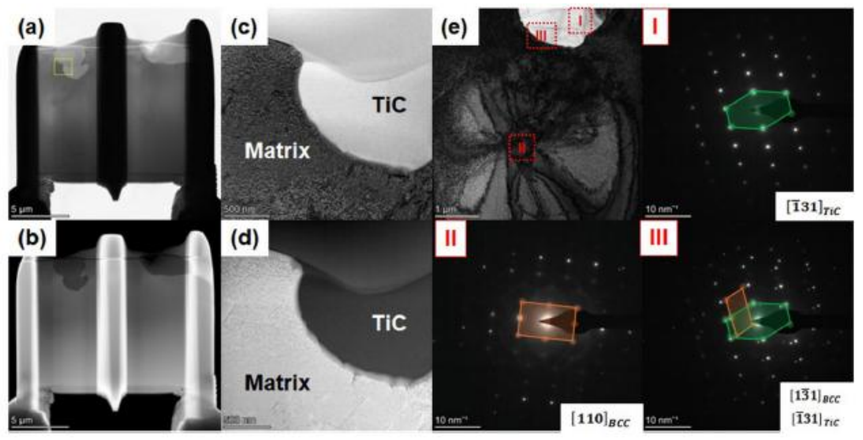

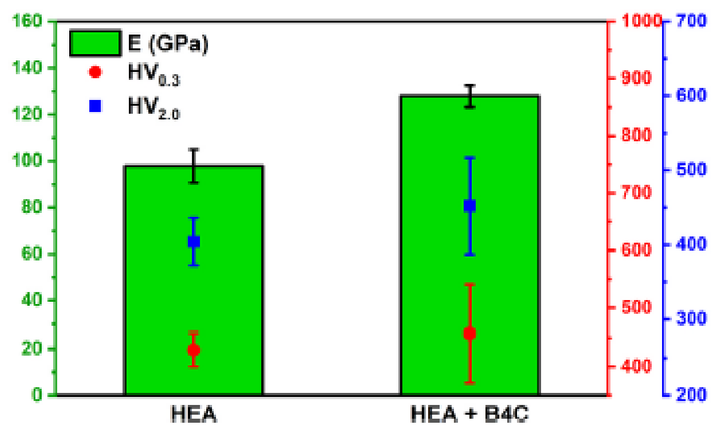

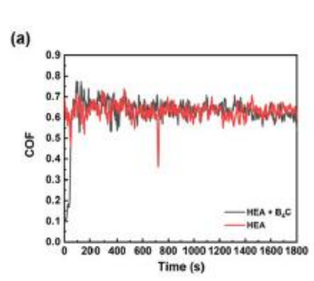

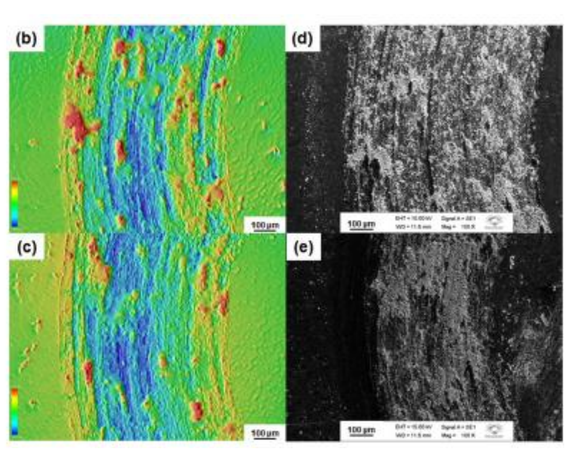

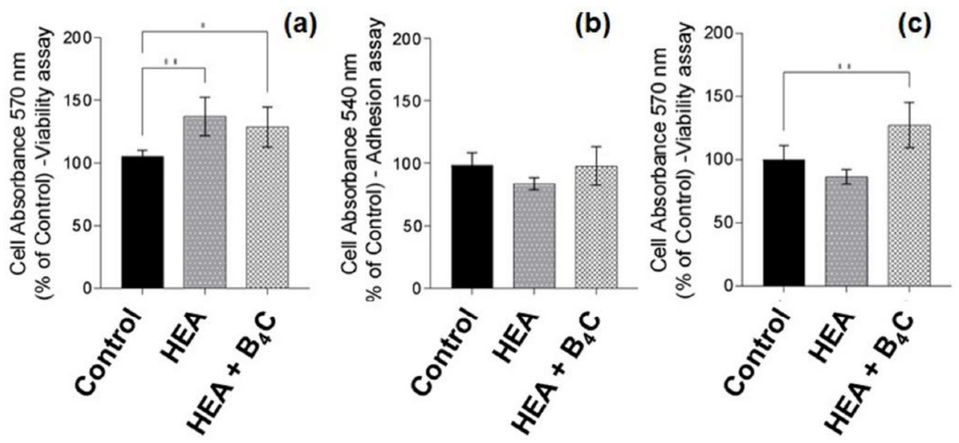

CONCLUSION

The TiNbZrTaMo HEA reinforced with TiC and TiB precipitates presented prospective mechanical, tribological, and biological behavior for use as biomedical implants. Further studies focusing on adjusting the B4C amount in solid solution can provide new insights into developing wear-resistant and low-elastic modulus biomaterials.

FUTURE WORK / REFERENCES

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