Paragraph Ran in the Queries

Paper Title: Multi-scale ceramic TiC solves the strength-plasticity equilibrium problem of high entropy alloy

Content :

At ambient conditions, the alloy sintered at 1600 °C exhibits a yield strength of 1133 MPa and a plasticity of 15 %, while the 1800 °C-sintered variant demonstrates a yield strength of 1303 MPa and a plasticity of 18 %. Remarkably, the alloy sintered at 1700 °C displays a yield strength of 1410 MPa and a plasticity of 22 %, coupled with a compressive strength of 2500 MPa (Fig. 3a). Thus, the alloy sintered at 1700 °C presents an optimal strength-plasticity synergy at ambient temperature. Upon reaching a test temperature of 1200 °C, the alloys sintered at 1600 °C, 1700 °C, and 1800 °C show yield strengths of 350 MPa, 575 MPa, and 416 MPa, respectively (Fig. 3b). Consequently, the 1700 °C-sintered alloy exhibits significantly superior high-temperature softening resistance compared to the other variants. Fig. 3c illustrates the compressive behavior of the 1700 °C-sintered alloy across temperatures from 900 °C to 1500 °C. Notably, when tested from 900 °C to 1200 °C, the yield strength of the alloy decreases only from 759 MPa to 575 MPa, indicating high resistance to softening. However, at temperatures surpassing 1300 °C, the alloy experiences notable softening. The poor plasticity at high temperatures is attributed to the oxidation of the alloys (Supplementary Fig. S4). Fig. 3d presents the temperature-dependent yield strength of the 1700 °C-sintered alloy alongside other reported RHEAs and traditional high-temperature alloys, such as Inconel 718 and Haynes 230 [[27], [28], [29], [30], [31], [32], [33]]. Inconel 718 and Haynes 230 begin to soften significantly around 700 °C, while the 1700 °C-sintered alloy demonstrates apparent softening above 1200 °C. Moreover, at temperatures exceeding 1200 °C, the yield strength of the 1700 °C-sintered alloy surpasses that of other RHEAs. Therefore, stable isostructural coherent interfaces endow the MoTaVW RHEA with ultrahigh strength, large plasticity, and remarkable high-temperature softening resistance.