

Supplementary Materials

Smart design tungsten-weighted refractory high entropy alloys (WW-RHEAs) under dynamic loading

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Supplementary Table 1. List of source publications used for database construction, including the alloy systems and strain-rate ranges covered by each reference

Alloy system	Strain-rate range (s ⁻¹)	Source publication
Al _{0.3} Ti _{0.3} CrFeCoNi	1500~4700	Mechanical properties and microstructure of the Al _{0.3} CoCrFeNiTi _{0.3} high entropy alloy under dynamic compression
AlCrFeCoNi	960~2000	Superior mechanical properties of AlCoCrFeNiTi _x high-entropy alloys upon dynamic loading
AlTi _{0.2} CrFeCoNi	1790~2770	
AlTi _{0.4} CrFeCoNi	1550~2900	
AlTi _{0.5} Cr _{1.5} Fe _{1.5} CoNi	2800~4600	Dynamic deformation behaviors and constitutive relations of an AlCoCr _{1.5} Fe _{1.5} NiTi _{0.5} high-entropy alloy
Al _{0.2} CrFeCoNiCu _{0.8} Si _{0.2}	3500	Microstructure and mechanical properties of Al _x Si _{0.2} CrFeCoNiCu _{1-x} high-entropy alloys
Al _{0.4} CrFeCoNiCu _{0.6} Si _{0.2}	3500	
Al _{0.5} CrFeCoNiCu _{0.5} Si _{0.2}	3500	
Al _{0.6} CrFeCoNiCu _{0.4} Si _{0.2}	3500	
Al _{0.8} CrFeCoNiCu _{0.2} Si _{0.2}	3500	
Al _{0.9} CrFeCoNiCu _{0.1} Si _{0.2}	3500	
Al _{0.1} CrFeCoNi	1000~2600	High strain-rate compressive deformation behavior of the Al _{0.1} CrFeCoNi high entropy alloy
Al _{0.1} CrFeCoNi	1000	Microstructural dependence of strain rate sensitivity in thermomechanically processed Al _{0.1} CoCrFeNi high entropy alloy

Al _{0.3} CrFeCoNi	1800	High-velocity deformation of Al _{0.3} CoCrFeNi high-entropy alloy: Remarkable resistance to shear failure
Al _{0.5} CrFeCoNi	2000	Influence of fine-scale B2 precipitation on dynamic compression and wear properties in hypo-eutectic Al _{0.5} CoCrFeNi high-entropy alloy
Al _{0.6} CrFeCoNi	2800~4000	Mechanical response and deformation behavior of Al _{0.6} CoCrFeNi high-entropy alloys upon dynamic loading
Al _{0.7} CrFeCoNi	2000	High strain rate response of Al _{0.7} CoCrFeNi high entropy alloy: dynamic strength over 2 GPa from thermomechanical processing and hierarchical microstructure
AlCrFeCoNi	2500	Effect of solidification rate on the microstructure and strain-rate-sensitive mechanical behavior of AlCoCrFeNi high-entropy alloy prepared by bridgman solidification
AlCrFeCoNi	1350~4000	Strain rate effects on the mechanical properties of an AlCoCrFeNi high-entropy alloy
AlCrFeCoNi	500~2500	Effect of strain rate and temperature on deformation and recrystallization behaviour of BCC structure AlCoCrFeNi high entropy alloy
AlCrFeCoNi _{2.1}	1000	Ballistic response of a FCC-B2 eutectic AlCoCrFeNi _{2.1} high entropy alloy
AlCrFeCoNi _{2.1}	1500~3200	Dynamic mechanical properties and microstructure evolution of AlCoCrFeNi _{2.1} eutectic high-entropy alloy at different temperatures
AlCrFeNi ₂ Cu	955~3182	Strain rate effects on the dynamic mechanical properties of the AlCrCuFeNi ₂ high-entropy alloy
TiVZrNb	3340~10200	Compression properties and impact energy release characteristics of TiZrNbV high-entropy alloy

TiV _{0.5} ZrNb _{0.5} Hf	4269~6329	
TiNb _{0.5} ZrMo _{0.5} Hf	5740~6816	The microstructure and mechanical properties of refractory high-entropy alloys with high plasticity
TiNb _{0.5} ZrHfTa _{0.5}	2827~3113	
TiVZr _{2.0} Nb _{2.0} Hf	3597~3759	
TiZrNbMo _{0.25} HfTa	2100~5300	Ultra-high strain-rate strengthening in ductile refractory high entropy alloys upon dynamic loading
TiZrNbMo _{0.5} HfTa	3000~5400	
TiZrNbMo _{0.75} HfTa	2100~6000	
TiZrNbHfTa	2100~3450	Mechanical behavior and microstructure of Ti ₂₀ Hf ₂₀ Zr ₂₀ Ta ₂₀ Nb ₂₀ high-entropy alloy loaded under quasi-static and dynamic compression conditions
TiZrNbHfTa	400~2600	Dynamic behavior and microstructure characterization of TaNbHfZrTi high-entropy alloy at a wide range of strain rates and temperatures
TiZrHfNi _{0.5}	500~3000	Dynamic mechanical properties and ignition behavior of TiZrHfX _{0.5} high-entropy alloys associated with temperature, trace element and strain rate
TiZrHfCu _{0.5}	2000	
TiZrHfAl _{0.5}	2000	
TiZrHfTa _{0.53}	950~2200	Microstructure, mechanical properties and energetic characteristics of a novel high-entropy alloy HfZrTiTa _{0.53}
TiZrHfTa _{0.7} W _{0.3}	2500~4200	Microstructural evolution and energetic characteristics of TiZrHfTa _{0.7} W _{0.3} high-entropy alloy under high strain rates and its application in high-velocity penetration
V ₁₀ Cr ₁₀ Fe ₄₅ Co ₃₅	3000	Effects of strain rate on room- and cryogenic-temperature compressive properties in metastable V ₁₀ Cr ₁₀ Fe ₄₅ Co ₃₅ high-entropy alloy

CrMnFeCoNi	1200~2800	Mechanical properties and microstructure of the CoCrFeMnNi high entropy alloy under high strain rate compression
CrMnFeCoNi	3000~4700	Strain rate effects of dynamic compressive deformation on mechanical properties and microstructure of CoCrFeMnNi high-entropy alloy
CrMnFeCoNi	1600	Adiabatic shear localization in the CrMnFeCoNi high-entropy alloy
CrMnFeCoNi	2100	Dynamic deformation behavior of a face-centered cubic FeCoNiCrMn high-entropy alloy
CrMnFeCoNi	750~2800	Effects of adiabatic heating and strain rate on the dynamic response of a CoCrFeMnNi high-entropy alloy
CrMnFeCoNi	3000~9000	High-entropy CoCrFeMnNi alloy subjected to high-strain-rate compressive deformation
CrMnFeCoNi	5000~8000	Simultaneous twinning and microband formation under dynamic compression in a high entropy alloy with a complex energetic landscape
CrMnFeCoNi	1200~2800	Mechanical behavior and shear band of a powder-metallurgy-fabricated CoCrFeMnNi high-entropy alloy during high strain-rate deformation
Cr ₂₆ Mn ₂₀ Fe ₂₀ Co ₂₀ Ni ₁₄	1000~3000	Dynamic impact behavior and deformation mechanisms of Cr ₂₆ Mn ₂₀ Fe ₂₀ Co ₂₀ Ni ₁₄ high-entropy alloy
Cr ₂₂ Mn ₁₄ Fe ₂₂ Co ₂₂ Ni ₂₀	9000	Investigation of nanotwins in the bimodal-structured Fe ₂₂ Co ₂₂ Ni ₂₀ Cr ₂₂ Mn ₁₄ alloy subjected to high-strain-rate deformation at cryogenic temperatures
Cr ₁₅ Mn ₂₀ Fe _{38.5} Co ₂₀ Cu _{1.5} Si ₅	1000~2500	Strain rate sensitive microstructural evolution in a TRIP assisted high entropy alloy: Experiments, microstructure and modeling

$\text{Cr}_{15}\text{Mn}_{30}\text{Fe}_{38}\text{Co}_{15}\text{Ni}_2$	1200~5200	Role of strain rate in phase stability and deformation mechanism of non-equiatomic $\text{Fe}_{38-x}\text{Mn}_{30}\text{Co}_{15}\text{Cr}_{15}\text{Ni}_2\text{Gdx}$ high-entropy alloy
$\text{Cr}_{15}\text{Mn}_{30}\text{Fe}_{37.9}\text{Co}_{15}\text{Ni}_2\text{Gd}_{0.1}$	1200~4800	
$\text{Cr}_{15}\text{Mn}_{30}\text{Fe}_{37.8}\text{Co}_{15}\text{Ni}_2\text{Gd}_{0.2}$	1300~5100	
$\text{Cr}_{26}\text{Fe}_{27}\text{Co}_{24}\text{Ni}_{23}$	2500~7000	Hierarchical nanotwins in $\text{Fe}_{27}\text{Co}_{24}\text{Ni}_{23}\text{Cr}_{26}$ high-entropy alloy subjected to high strain-rate Hopkinson bar deformation
CrFeCoNi	700~2700	Thermo-mechanical characterization and dynamic failure of a CoCrFeNi high-entropy alloy
CrFeCoNi	1870~3998	Effects of annealing temperatures on mechanical behavior and penetration characteristics of FeNiCoCr high-entropy alloys
$\text{Cr}_{10}\text{Fe}_{21}\text{Co}_{30}\text{Ni}_{30}\text{W}_9$	3000~4100	Enhanced dynamic deformability and strengthening effect via twinning and microbanding in high density NiCoFeCrMoW high-entropy alloys
$\text{Cr}_{10}\text{Fe}_{23}\text{Co}_{30}\text{Ni}_{30}\text{Mo}_4\text{W}_3$	3000~4500	
$\text{NiCrFeCoMo}_{0.2}$	1390~1650	Dynamic mechanical properties of the selective laser melting $\text{NiCrFeCoMo}_{0.2}$ high entropy alloy and the microstructure of molten pool
CrCoNi	1074	Dynamic deformation behavior and microstructure evolution of CoCrNiMo_x medium entropy alloys
$\text{CrCoNiMo}_{0.1}$	1003	
$\text{CrCoNiMo}_{0.2}$	967	
MnFeCoNiCu	3000	High strain rate compression behaviour of single phase CoCuFeMnNi high entropy alloy
$(\text{Al}_{0.2}\text{Cr}_{0.9}\text{FeNi}_{2.5}\text{V}_{0.2})_{95.7}\text{W}_{4.3}$	3000	High susceptibility to adiabatic shear banding and high dynamic strength in tungsten heavy alloys with a high-entropy alloy matrix
WMoFeNi	2000	"Self-sharpening" tungsten high-entropy alloy

Note: The ranges listed in the third column are the full strain-rate ranges reported in the corresponding source publications, not the exact intervals of the subset of data points actually incorporated into the present training database. The records extracted from these publications and used for model training span 400~6000 s⁻¹. Although some source publications reported test conditions extending beyond 6000 s⁻¹, those specific higher-rate records were not present in the compression dataset extracted for this study; no performance- or trend-based filtering was applied. The only data-exclusion criterion was the objective removal of dynamic tension records (64 data points), as the present study focuses exclusively on dynamic compressive properties.