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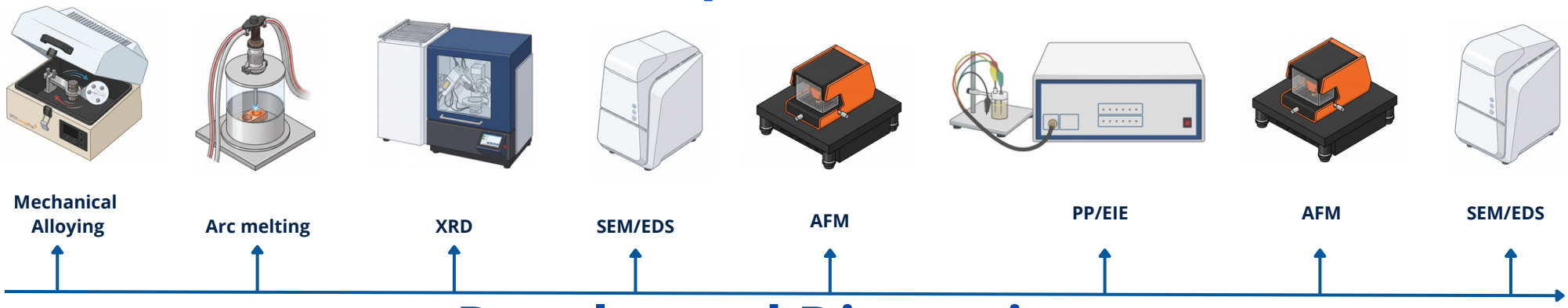
ELECTROCHEMICAL, MORPHOLOGICAL, AND TOPOGRAPHICAL ANALYSIS OF CANTOR ALLOY VARIATIONS BEFORE AND AFTER CORROSION

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Introduction

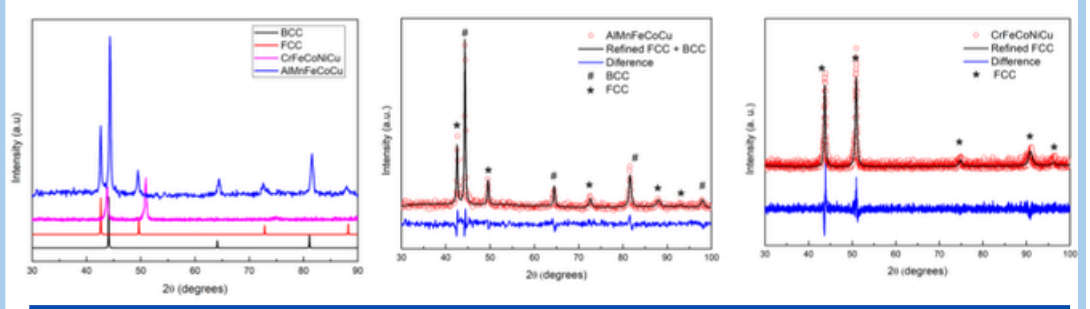
High-entropy alloys (HEAs) represent a paradigm shift in the design of metallic materials, breaking away from the traditional concept based on a single solvent element to explore multicomponent matrices in equiatomic or near-equiatomic proportions. This innovative class of materials has attracted intense industrial and academic interest due to its exceptional mechanical and physicochemical properties, such as high strength, excellent thermal stability, and remarkable resistance to corrosion and wear. However, the technological advancement of these alloys requires a deep understanding of the impact that the addition or substitution of specific elements has on phase stability and the integrity of their passive films, especially when exposed to aggressive environments that simulate real service conditions.

Experimental



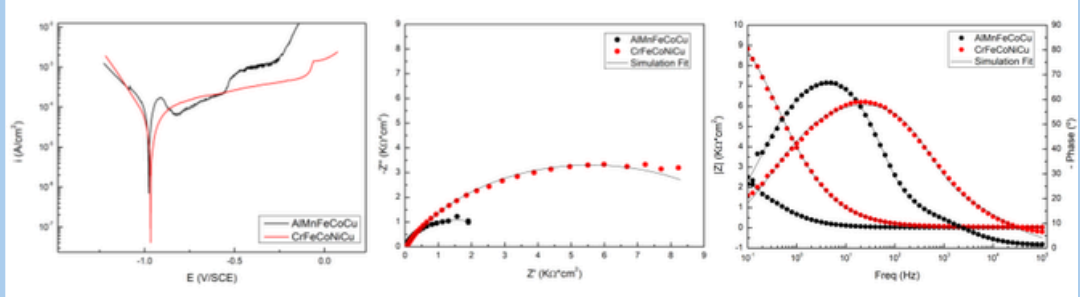
Results and Discussion

X-Ray Diffraction



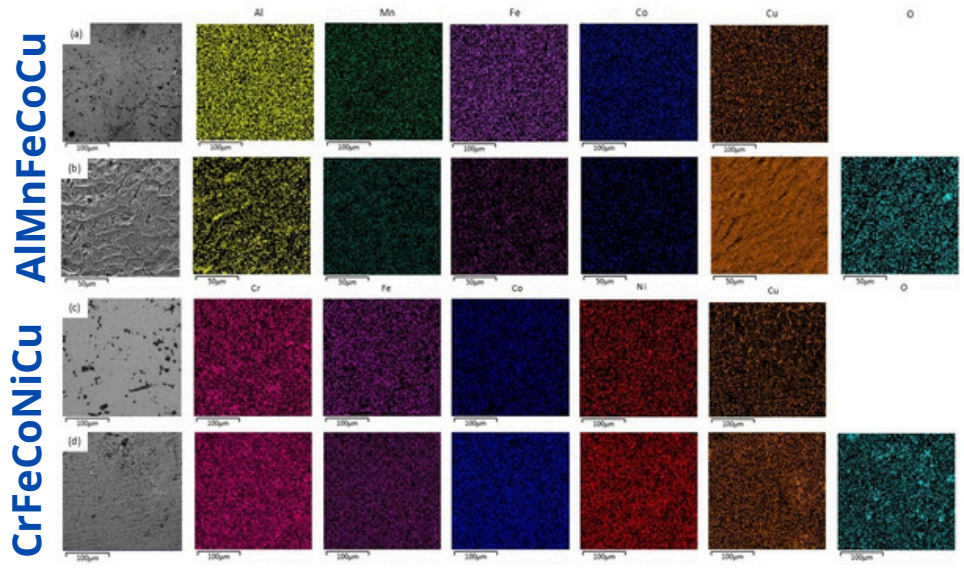
	AlMnFeCoCu		CrFeCoNiCu
	FCC	BCC	FCC
α=β=γ (Å)	3.678	2.889	3.587
Phasenanteil	65	35	100
Volume (Å³)	49.778	24.123	46.158
χ2	1.93		1.31
GOF	1.39		1.15

Electrochemical Analyses



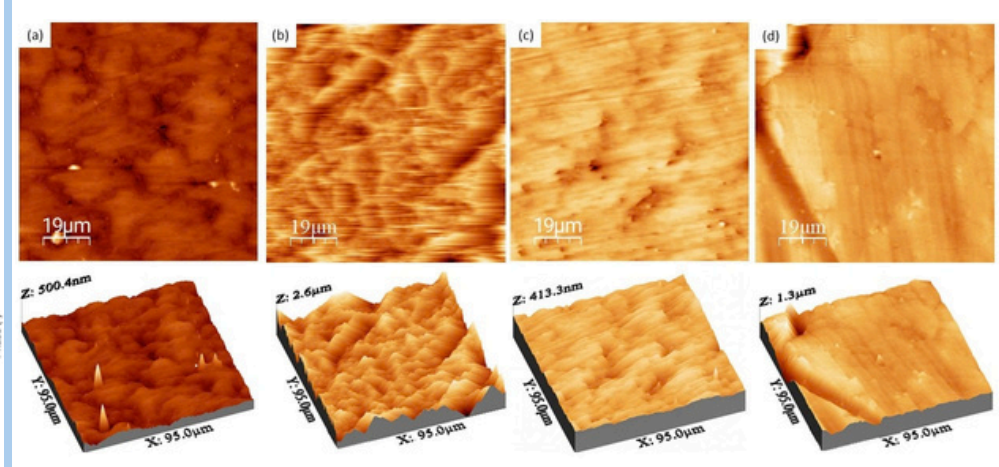
	R1 Ω*cm²	R2 Ω*cm²	R3 KΩ*cm²	Q1 μF/cm²	n1	Q2 μF/cm²	n2	Ecorr V/SCE	icorr μA/cm²	Epit V/SCE
AlMnFeCoCu	16.64 ± 0.06	18.61 ± 1.00	2.962 ± 0.861	240.51 ± 8.99	0.740 ± 0.003	82.93 ± 6.56	0.965 ± 0.011	-0.97	18	-0.75
CrFeCoNiCu	33.76 ± 0.29	73.06± 8.43	11.140 ± 0.132	50.88 ± 1.56	0.65 ± 0.01	6.14 ± 1.08	0.87 ± 0.01	-0.96	5.8	-0.06

Scanning Electronic Microscope



Atomic Force Microscope

AlMnFeCoCu CrFeCoNiCu



HEA	Condition	Roughness (rms)	Highest Peak (nm)
AlMnFeCoCu	Before	3.081	5.004
	After	29.860	2600
CrFeCoNiCu	Before	2.769	4.133
	After	10.790	1300

Conclusions

- **Phase Stability: The CrFeCoNiCu alloy maintained a single-phase (FCC) structure, while the AlMnFeCoCu system formed a dual-phase (FCC+BCC) matrix;**
- **Accelerated Degradation: The dual-phase heterogeneity generated severe micro-galvanic cells, increasing the corrosion current and surface roughness of the lightweight alloy in a saline medium;**
- **Overall Performance: The alloy (CrFeCoNiCu) demonstrated superior protection, evidencing that the pursuit of weight reduction significantly compromised corrosion resistance.**

Acknowledgements

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References

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