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Preparation and investigation of 3D Zinc-Nickel coatings for oxygen evolution reaction

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Table I. The preparation of the 3D Zn-Ni coatings from a bath containing 1 M $Zn(NO_3)_2$, and 1 M $NiSO_4$.

Coatings	Deposition conditions		Elements, at%	
	j / mAcm^{-2}	t / min	Zn	Ni
ZnNi/Ti-1	500	1	75	25
ZnNi/Ti-2	50	1	80	20
	500	5		
ZnNi/Ti-3	50	1.5	50	50
	250	1.5		
	500	2		

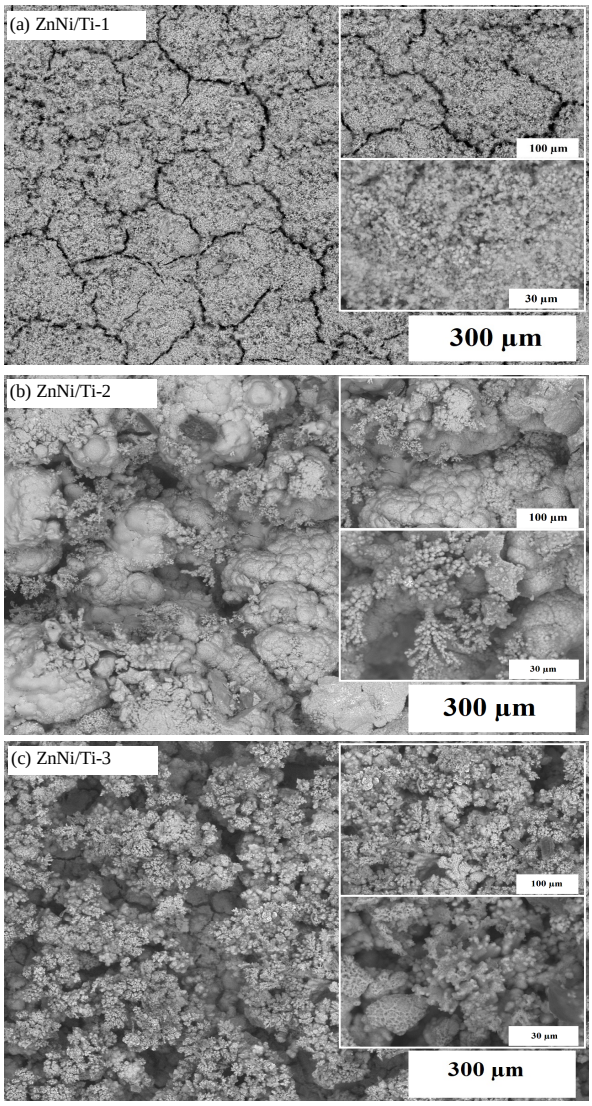

Fig. 1. FESEM images of the prepared 3D Zn-Ni coatings.

Table II. Electrochemical performance of the tested coatings toward OER in alkaline media.

Coatings	Tafel slope / mV dec^{-1}	j_0 / mAcm^{-2}	α	R^2
ZnNi/Ti-1	249.92	0.357	0.236	0.99998
ZnNi/Ti-2	322.22	0.476	0.190	0.99749
ZnNi/Ti-3	253.11	0.302	0.241	0.99982

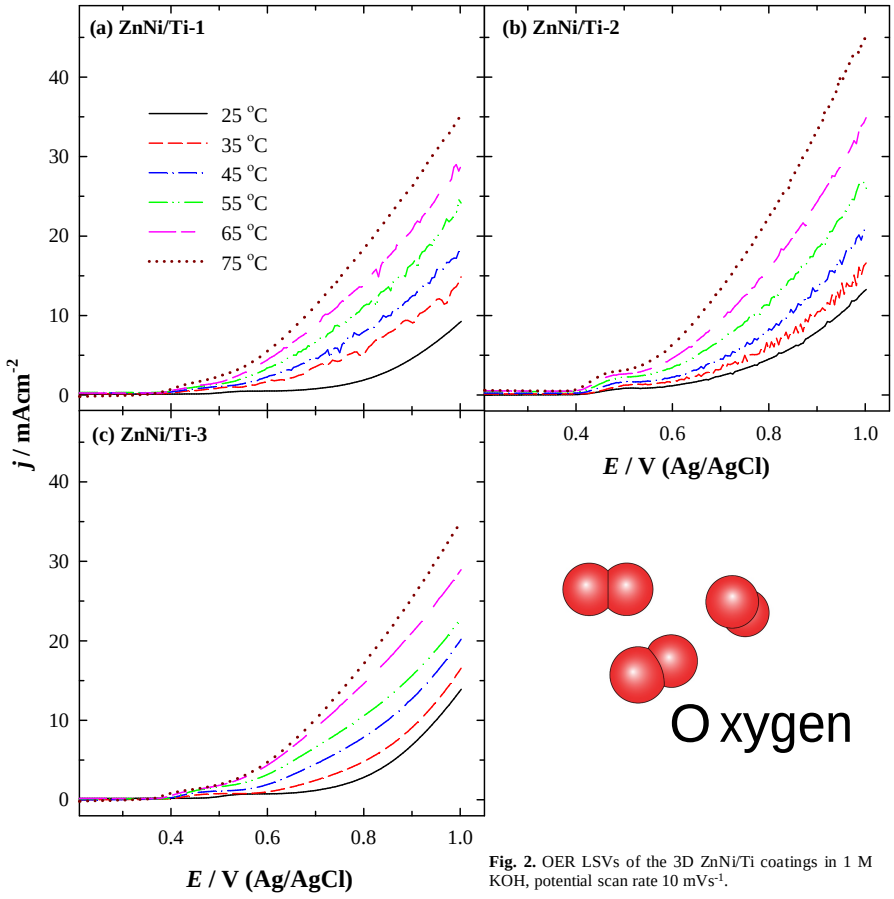

Fig. 2. OER LSVs of the 3D ZnNi/Ti coatings in 1 M KOH, potential scan rate 10 mVs^{-1}.

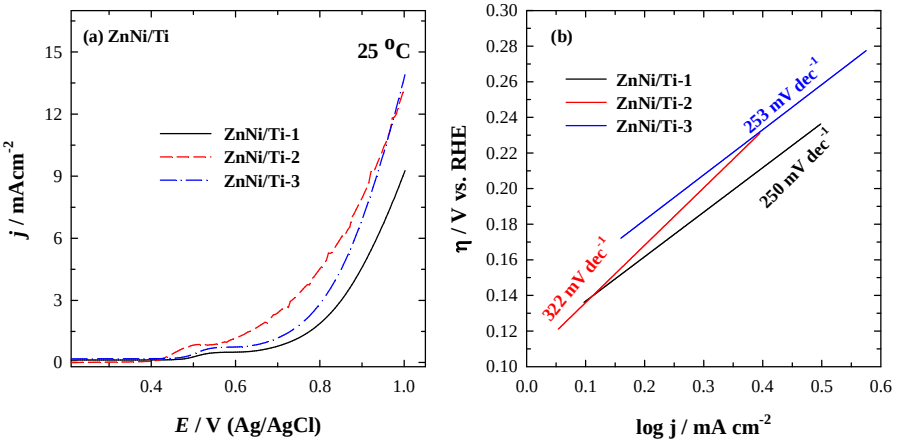

Fig. 3. OER LSVs of the 3D ZnNiTi coatings in 1 M KOH, potential scan rate 10mVs^{-1} at 25 °C. (b) The corresponding Tafel lines of the same with the slope values.

CONCLUSIONS

- ✓ 3D metal Zinc-Nickel foams were prepared by electrochemical deposition on titanium surface.
- ✓ The prepared 3D metal Zinc-Nickel foams showed electroactivity for oxygen evolution reaction. The highest current density for OER was recorded at ZnNi/Ti-2 electrode.
- ✓ The current densities for OER increase 2.5, 3.4, and 3.8 times with an increase of temperature from 25°C to 75°C using ZnNi/Ti-3, ZnNi/Ti-2, and ZnNi/Ti-1 electrodes, respectively.

Acknowledgements

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