Surface potential controlled by Al additive at interface between Mg matrix and CNT dispersoids

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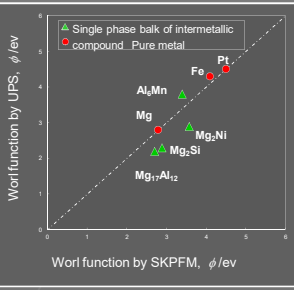
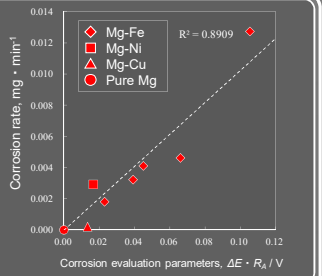
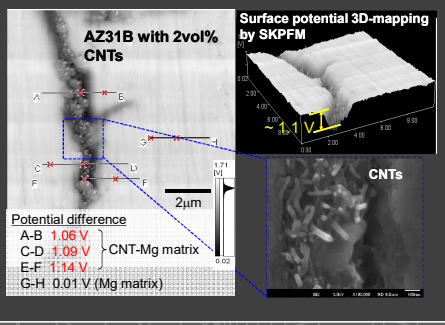
Introduction

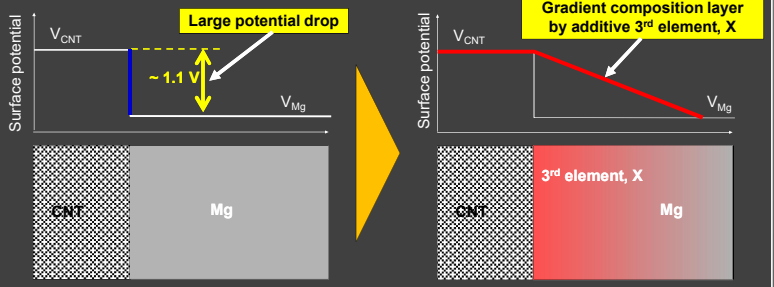
Surface potential measurement at the interface between dispersions and metal matrix is effective for quantitative evaluation of micro-scale galvanic corrosion phenomena, and results in the selection of additive alloying elements in materials design to improve corrosion resistance. According to the data of surface potential difference at the interface of intermetallic compounds, the electro-potentially graded layers were formed at the interface to reduce the surface potential causing local cells.



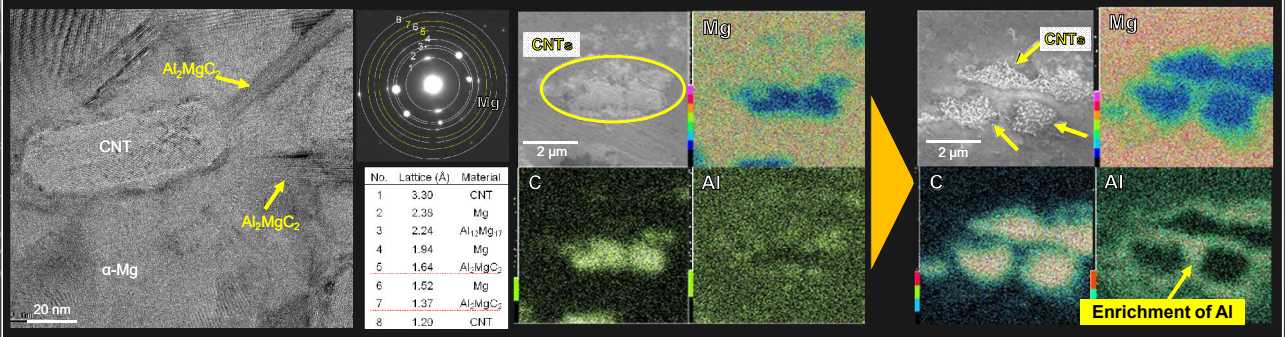


Materials and methods

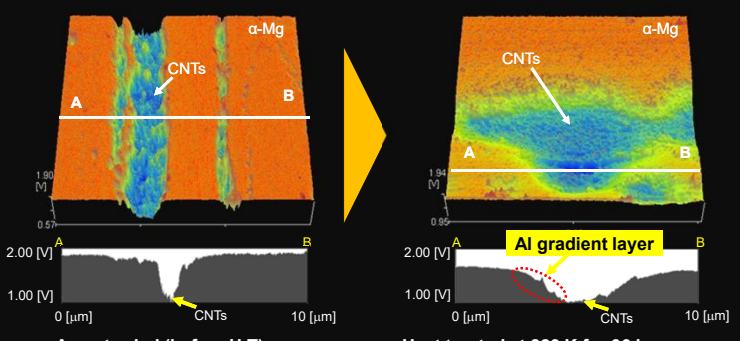




Mechanical properties of Mg-CNT composite specimen



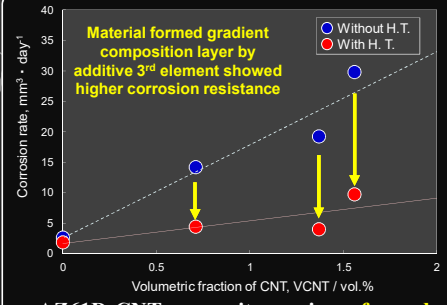
Surface potential measurement results



No	CNT (vol.%)	Corr. rate$_{before}$ (mm^3 / day)	Corr. rate$_{after}$ (mm^3 / day)
1*	-	2.69	1.90
2	0.71	14.24	**4.46**
3	1.37	19.28	**4.06**
4	1.56	29.84	**9.76**

*: as-received powders consolidated and extruded with same condition

Conclusion



- AZ61D-CNT composite specimen formed Al_2MgC_2 at interface between CNT and Mg. Al of the composite was concentrated around Al_2MgC_2 by annealing.
- Annealed specimen formed a graded structure of the surface potential.
- Annealed specimen showed good corrosion resistance than non annealed specimen.