

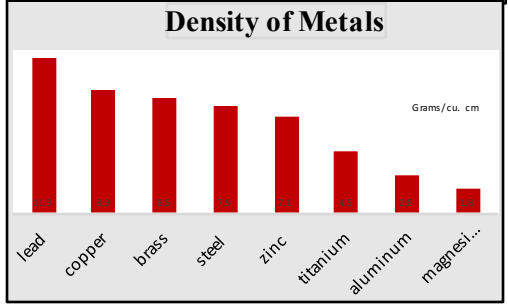
# Non-Isothermal Precipitation Hardening of AZ91 Magnesium Alloy

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## Background

The high strength-to-weight ratio of magnesium alloys make them an attractive candidate for increasing fuel efficiency.

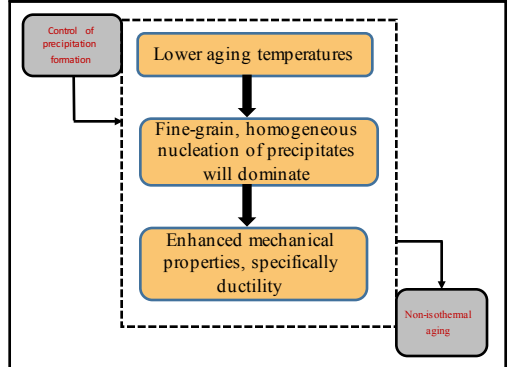


## Problem Statement

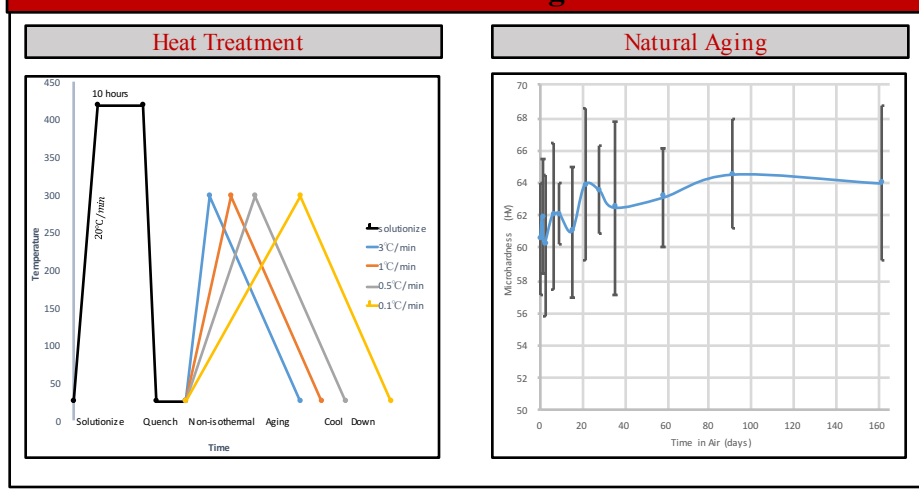
Application of Magnesium for structural applications is still limited due to its relatively poor mechanical properties.

Property	Unit	AZ91	AM60	AM50	AM20	AS41	AS21	AE42
Ultimate Tensile Strength	MPa	240 (250)	225 (240)	210 (230)	190 (210)	215 (220)	175 (220)	230 (230)
Tensile Yield Strength (0.2% offset)	MPa	160 (160)	130 (130)	125 (125)	90 (90)	140 (140)	110 (120)	145 (145)
Compressive Yield Strength	MPa	160	130	125	90	140	110	145
Fracture Elongation	%	3 (7)	8 (13)	10 (15)	12 (20)	6 (15)	9 (13)	10 (11)
Elastic Modulus, tension	GPa	45	45	45	45	45	45	45
Elastic Modulus, shear	GPa	17	17	17	17	17	17	17
Brinell Hardness		70	65	60	45	60	55	60
Impact Strength Charpy un-notched test bars	J	6 (9)	17 (18)	18 (18)	18 (18)	4 (16)	5 (12)	5 (12)

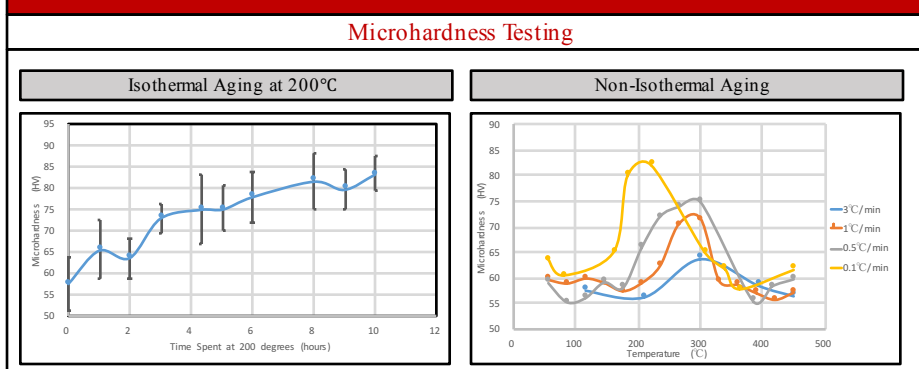
## Objective



## Research Design

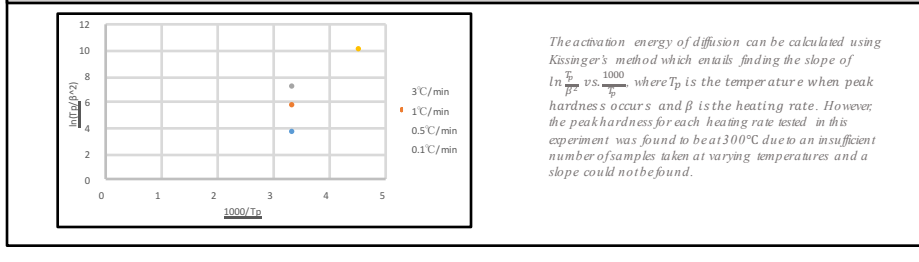


## Results

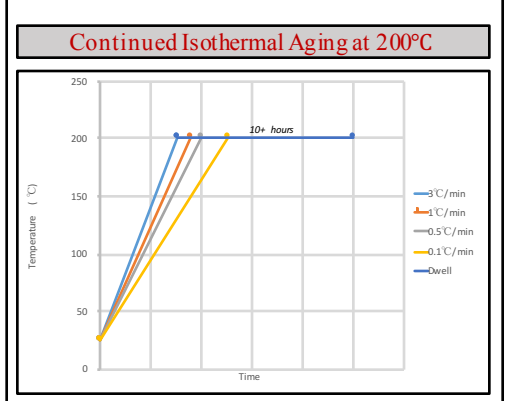


Although similar in value, it takes 33.3 hours for AZ91 to reach 221°C at 0.1°C/min, while it took AZ91 only 10 hours to reach its peak during isothermal aging at 200°C.

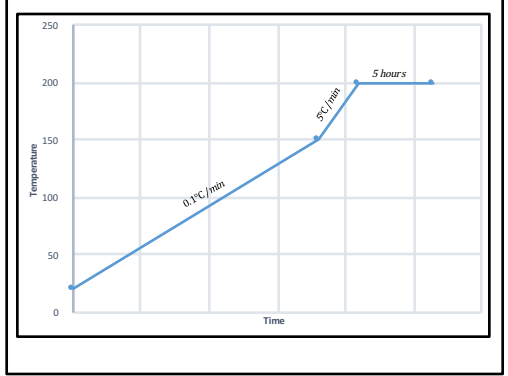
### Kissinger Method for Activation Energy



## Future Research



### Dual Heat Treatment



## Acknowledgements

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