Sabancı Üniversitesi

PURE
PROGRAM FOR UNDERGRADUATE RESEARCH

MW Assisted Hydration Reactions of Cements

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Introduction

Limited flight time restricts the time required for the repair of landing fields. This puts severe limitations on the suitable material to be used to repair and also the proper curing method. Cement was portable, cheap and easy to shape so it appeared to be the best candidate. Common heating methods use open flame heaters or provide heating enclosures around the repaired area which are inefficient. On the other hand, microwave energy vibrates the polar and dipole molecules and the resulting friction force generates volumetric heat.

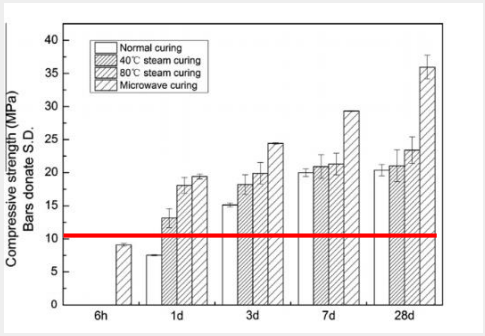

Fig. 1. The compressive strength of mortars under four curing regimes at different ages.

Process

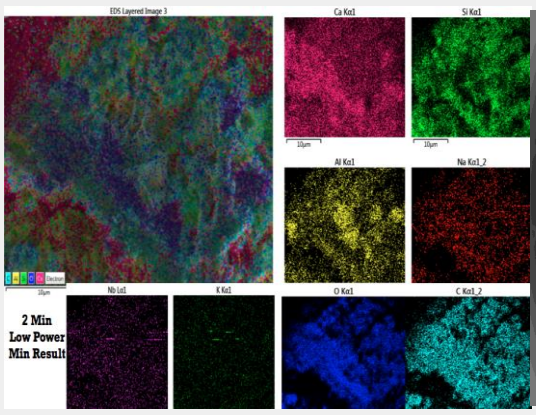

Fig. 2. EDX Result of 2 Minutes Low Power MW-ed/Bright color presents high quantity

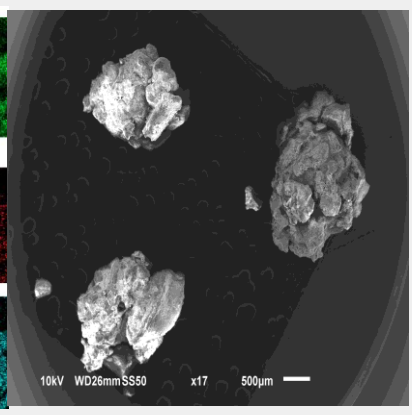

Fig. 3. Sample of 1 Day-2 Min-Low Power (min result)

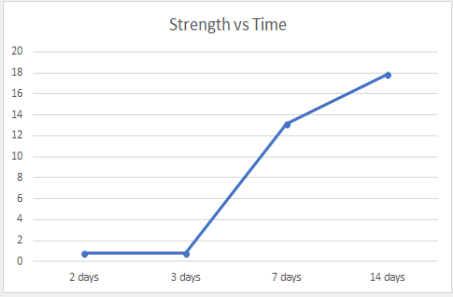

Fig. 4. UTM Results of MW non Assisted Cement, Strength vs Time graph

Experiment 1

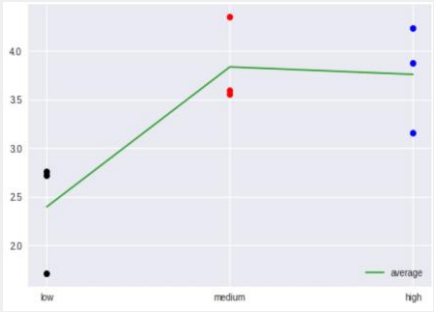

Fig. 5. UTM Results of MW Applicated (2 Minutes)1 Day Cement, med's average is 3.84MPa

Experiment 2

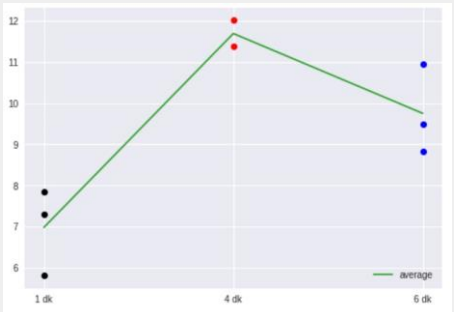

Fig. 6. UTM Results of MW Applicated (Med Power)1 Day, 4min's average is 10.08MPa

Experiment 3

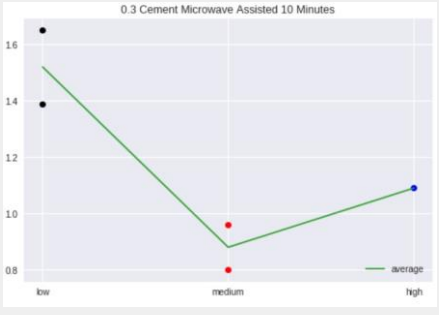

Fig. 7. UTM Results of MW non Assisted Cement, low power average is 1.52 MPa

Conclusion and Future Works

The maximum result is 12,63 MPa under the optimum level of mw power and application period. The followings should be investigated as future work:

- Analysis of XRD results
- Experiments on 3 and 7 days cements
- Long term effect of mw
- Mechanical system that emits mw by walking through the landing fields
- Analysis of synthesis-added cements
- Experiments on 0.5 w/c ratio cement for 3 and 5 minutes (med power)

References

- Kong, Y., Wang, P., Liu, S., & Gao, Z. (2016). Hydration and microstructure of cement-based materials under microwave curing. *Construction and Building Materials*, *114*, 831-838. doi:10.1016/j.conbuildmat.2016.03.202