

# KNOWING THE DIFFERENCE GALVANIZED REBAR RESEARCH



# Key Points for Presentation



Galvanized rebar is the lowest cost corrosion resistant rebar for the life of your steel reinforced concrete structures

- Differences comparing ASTM A1094 and ASTM A767
  - Both are great products and widely recognized and specified

I WANT YOU TO KNOW the key differentiators between the two standards and show you today that:

- ✓ A1094 Demonstrates improvements with better testing data
- ✓ A1094 has an innovative controlled process resulting in improved consistent quality
- ✓ A1094 has a far superior supply chain
- ✓ And A1094 is the lowest cost corrosion resistant rebar for owners over the life of your critical infrastructure





# Commercial Metals Company - Who We Are



*A global, vertically-integrated recycling, steel manufacturing and fabricating enterprise.*

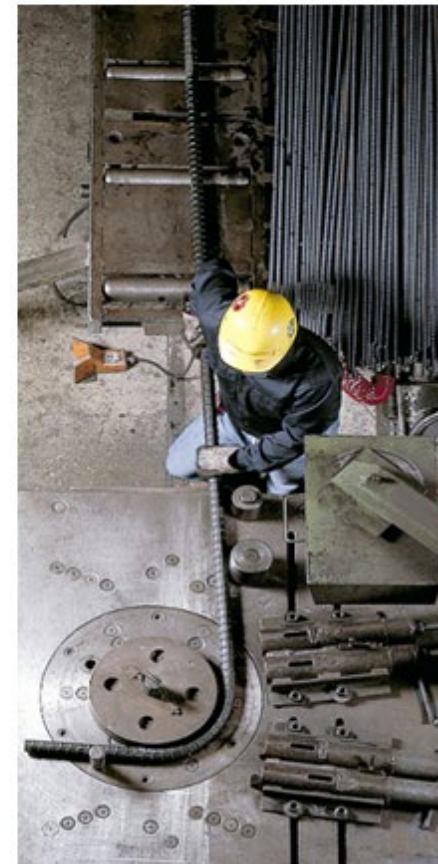
Metals Recycling



Steel Production



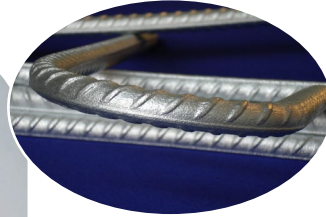
Steel Fabrication



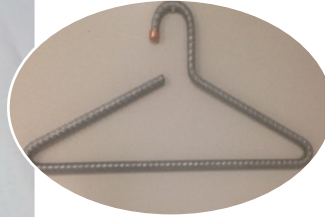
# A1094 is Continuously Galvanized Reinforcement



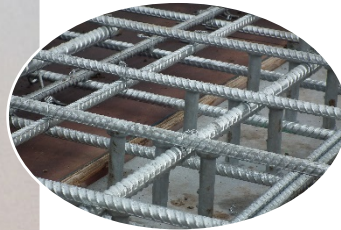
*What is A1094?*



Continuous Galvanizing process yields consistent, formable zinc coating



Fabricate prior to processing.  
Fabrication with no special equipment



Thicker pure zinc coating increases corrosion initiation threshold



Inventoried at reduced competitive cost with logistical “last mile” advantages

# ASTM Standard Specifications for Galvanized Reinforcement



## **Designation: A1094/A1094M**

Standard Specification for  
Continuous Hot-Dip Galvanized Steel Bars for Concrete Reinforcement



## **Designation: A1055/A1055M**

Standard Specification for  
Zinc and Epoxy Dual-Coated Steel Reinforcing Bars



## **Designation: A767/A767M**

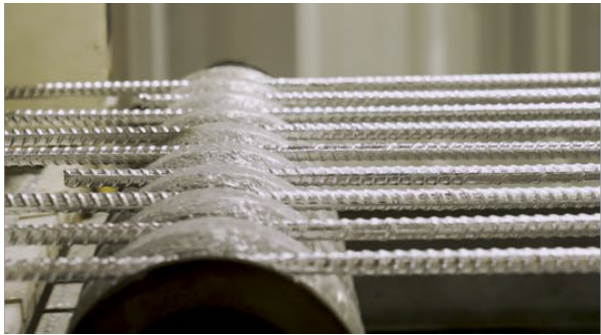
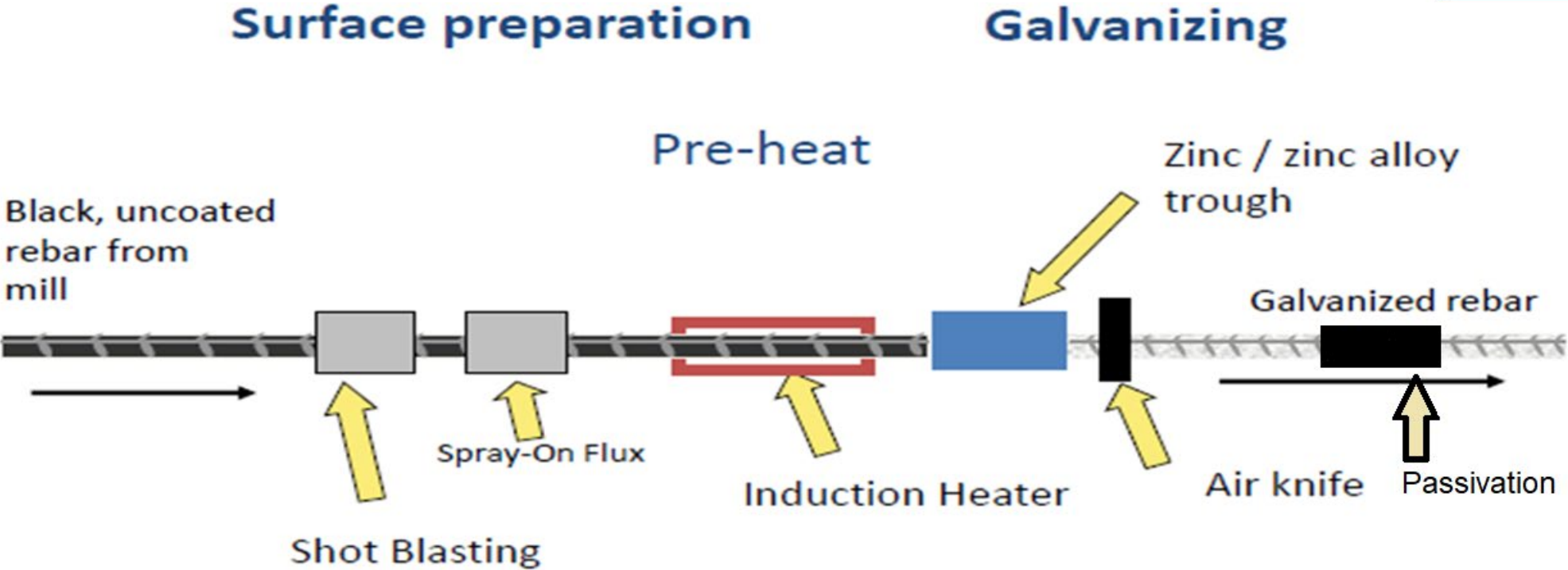
Standard Specification for Zinc-Coated (Galvanized) Steel Bars  
for Concrete Reinforcement



# Fabrication



# How It's Made





# Continuous Galvanized Rebar Process





# Where A1094 Rebar is Being Used

## A1094 Applications



Precast Structures  
Shotcrete Structures



Bridge Decks



Transportation Systems



Fresh Water Docks and Marinas  
Coastal and Marine Structures



Wastewater Treatment



Parking Garages  
Balconies



Foundations



# Case Study: Bridge - Buffalo Creek, Iowa



ASTM A1094 provides solutions to combat corrosion on bridges (old and new)



This 200' bridge was constructed entirely Of galvanized steel, including h-piles, girders (superstructure).

GalvaBar improved tight construction timelines allowing construction to finish before the harsh winter arrived.





# Case Study: Paving – U.S. Army Corp of Engineers



**A1094 was procured to combat corrosion  
*plus* take advantage of on-time delivery benefits + reliable installation features**



**Project:** Fort Hood Mixed Use

**Location:** Killeen, Texas

**Information:** MW Builders, Austin

**Fabrication:** Barnsco Dallas



# Texas A&M CIR Research in Progress



*A1094 and A767 testing results vs A615 “Black” Uncoated rebar*



**MATERIALS SCIENCE  
& ENGINEERING**  
TEXAS A&M UNIVERSITY

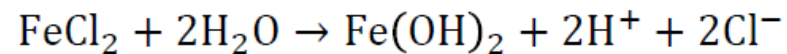
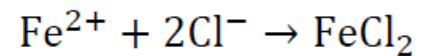
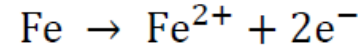
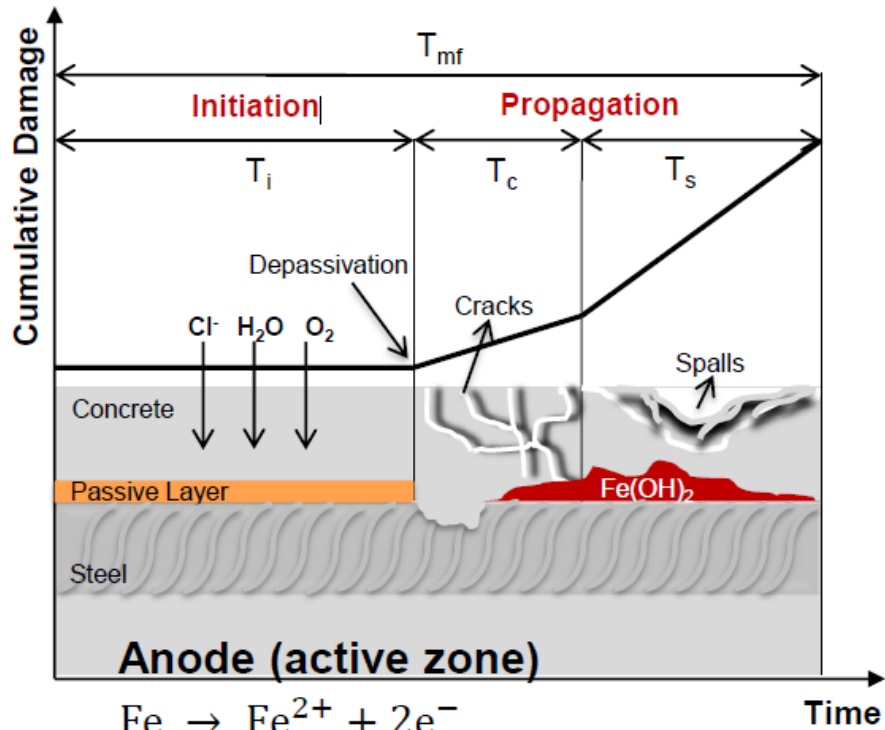
## **Phase I- Comprehensive corrosion performance study for materials used for reinforced concrete (RC) system/elements**

Deeparekha Narayanan, Yi Lu, Yenny Cubides, Ivan Karayan, Homero Castaneda

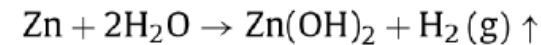
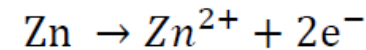
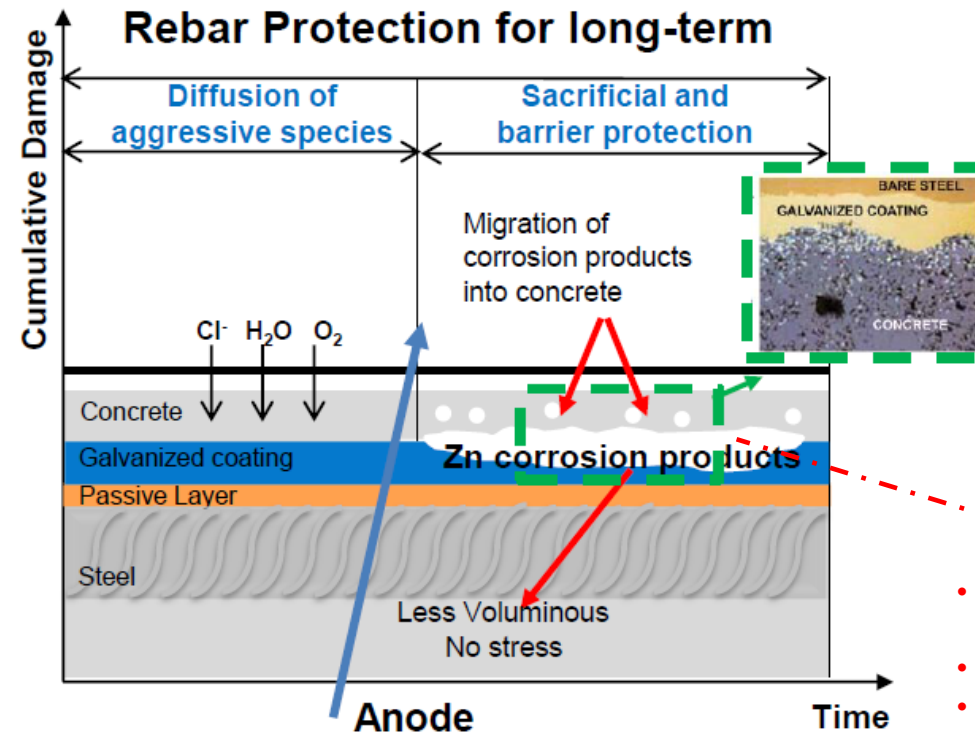
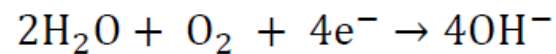
Department of Material Science and Engineering, Texas A&M University



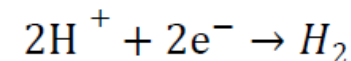
# How Galvanized rebar works



**Cathode (passive layer)**

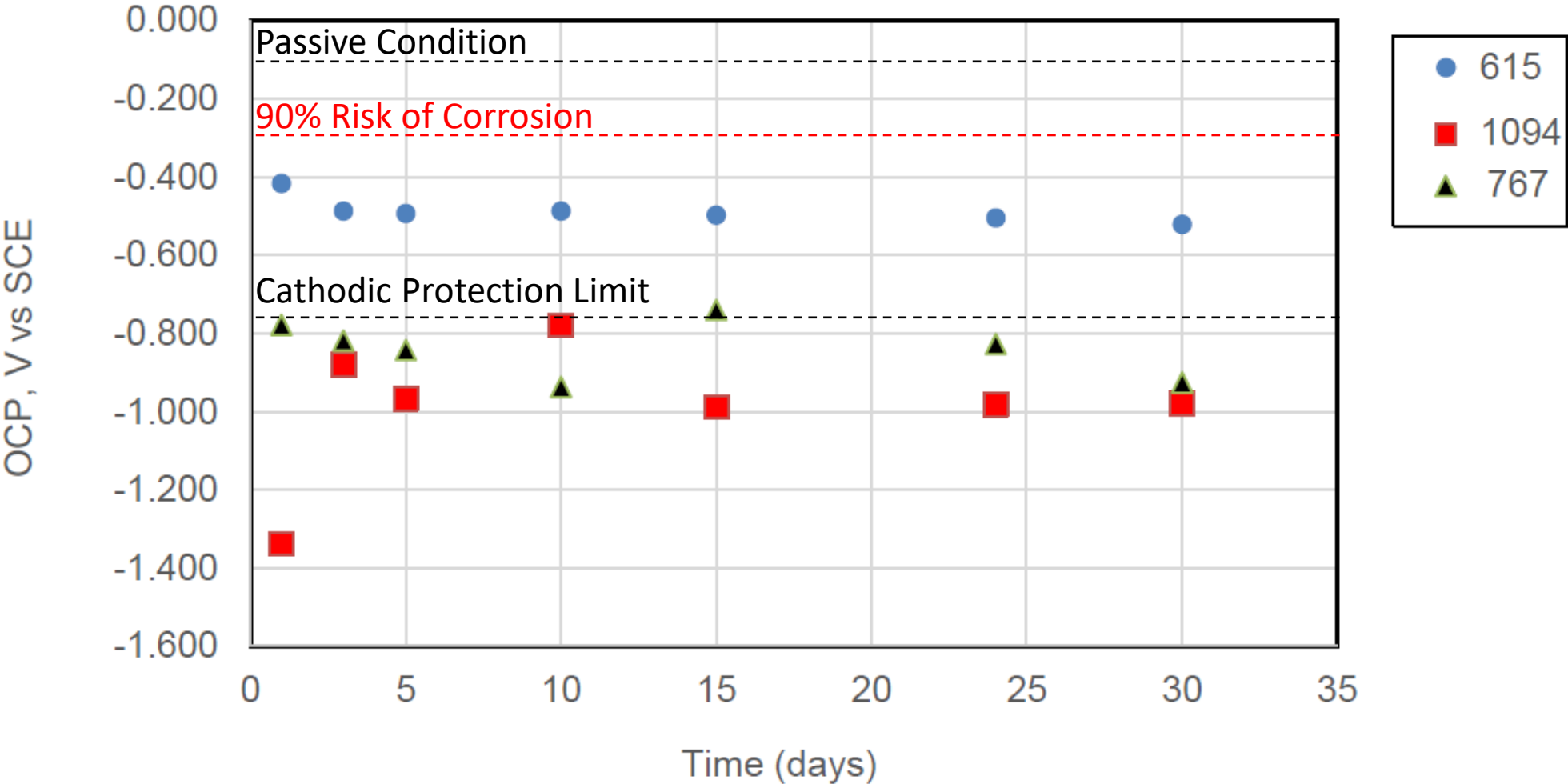


**Cathode**



- Less Voluminous Zn corrosion products
- More homogeneous coating
- Efficient use of Zinc
- Improvements in protection

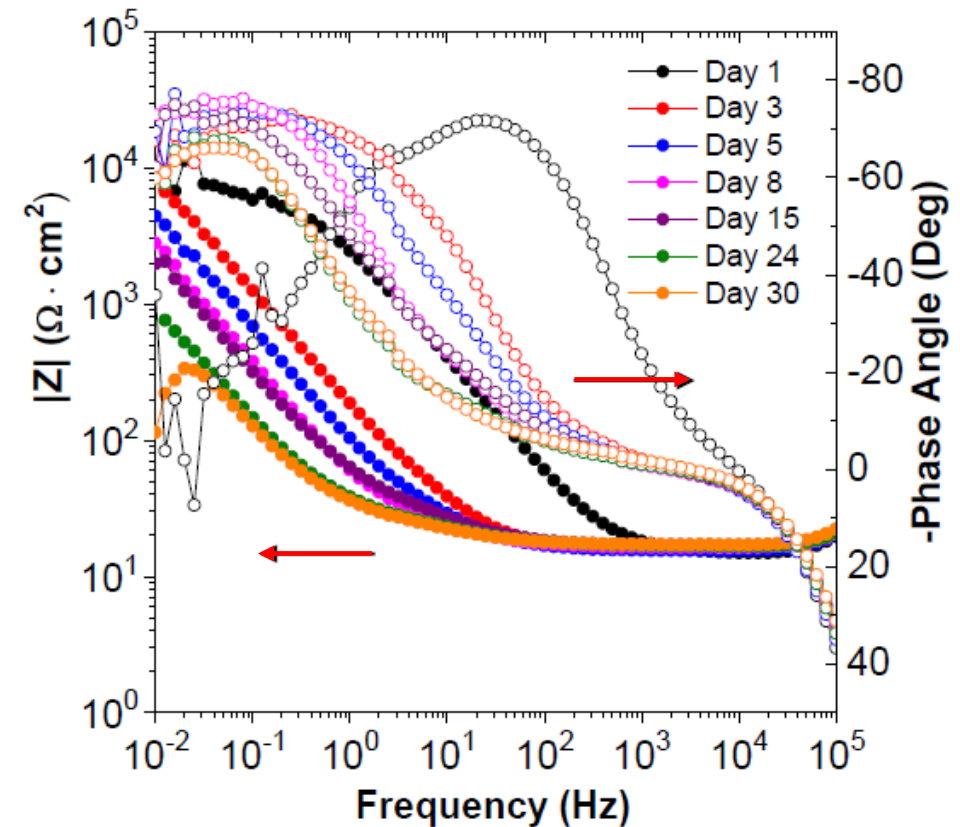
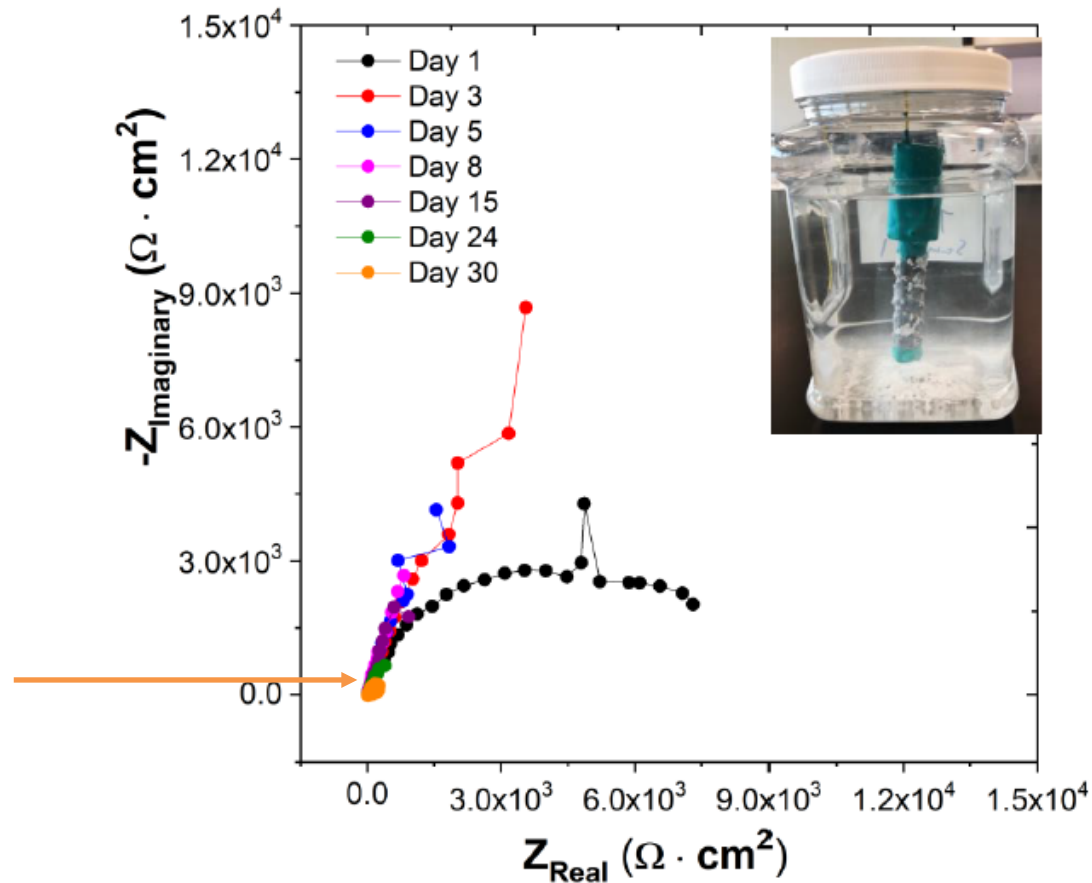
# Open Circuit Potential





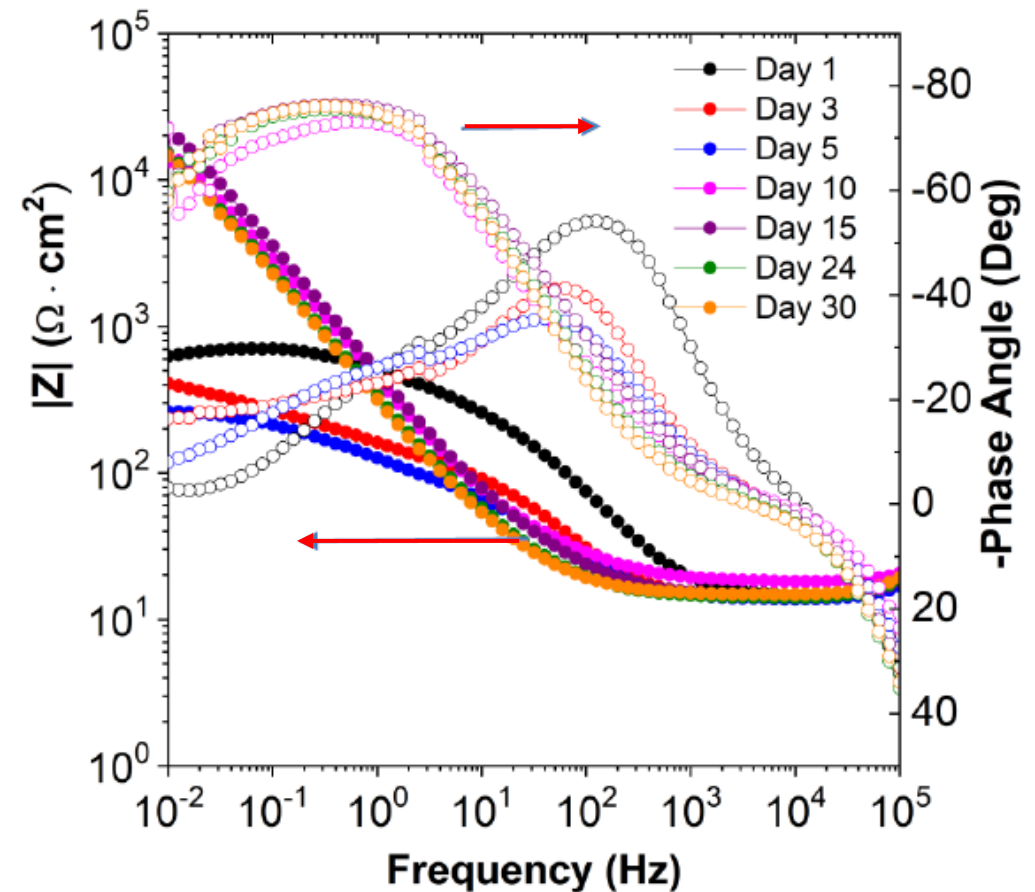
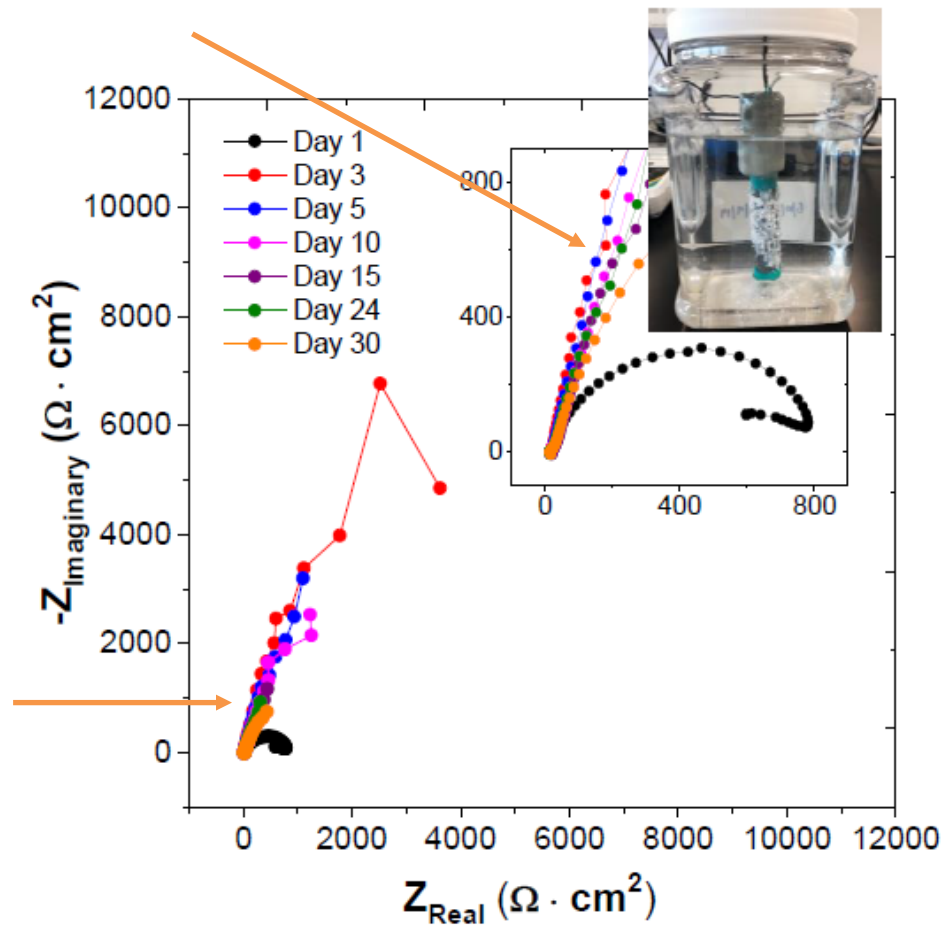
# Electrochemical Impedance Spectroscopy (EIS)

## EIS Results for 767 Sample



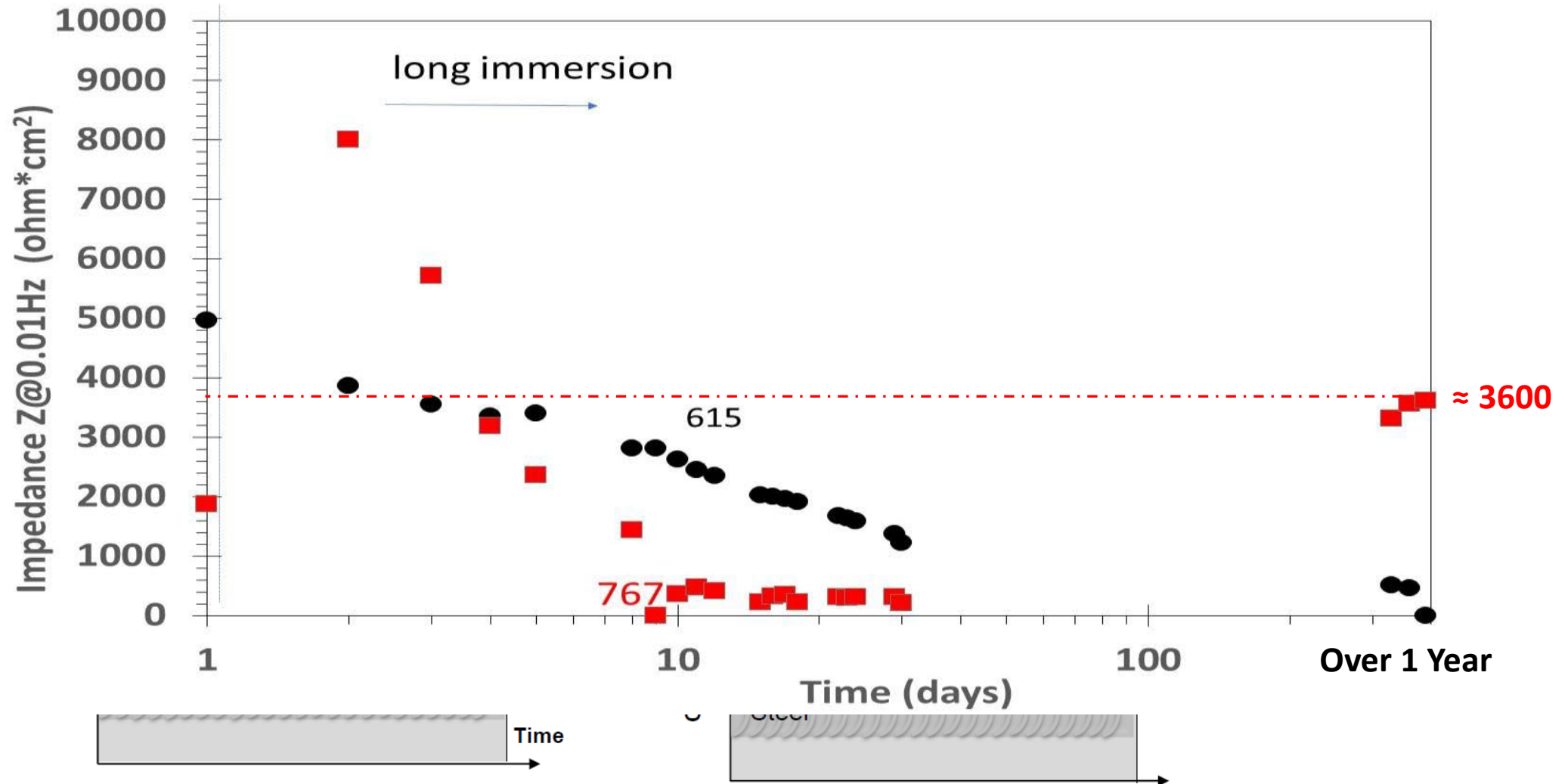
# Electrochemical Impedance Spectroscopy (EIS)

## EIS Results for 1094 CGR Sample

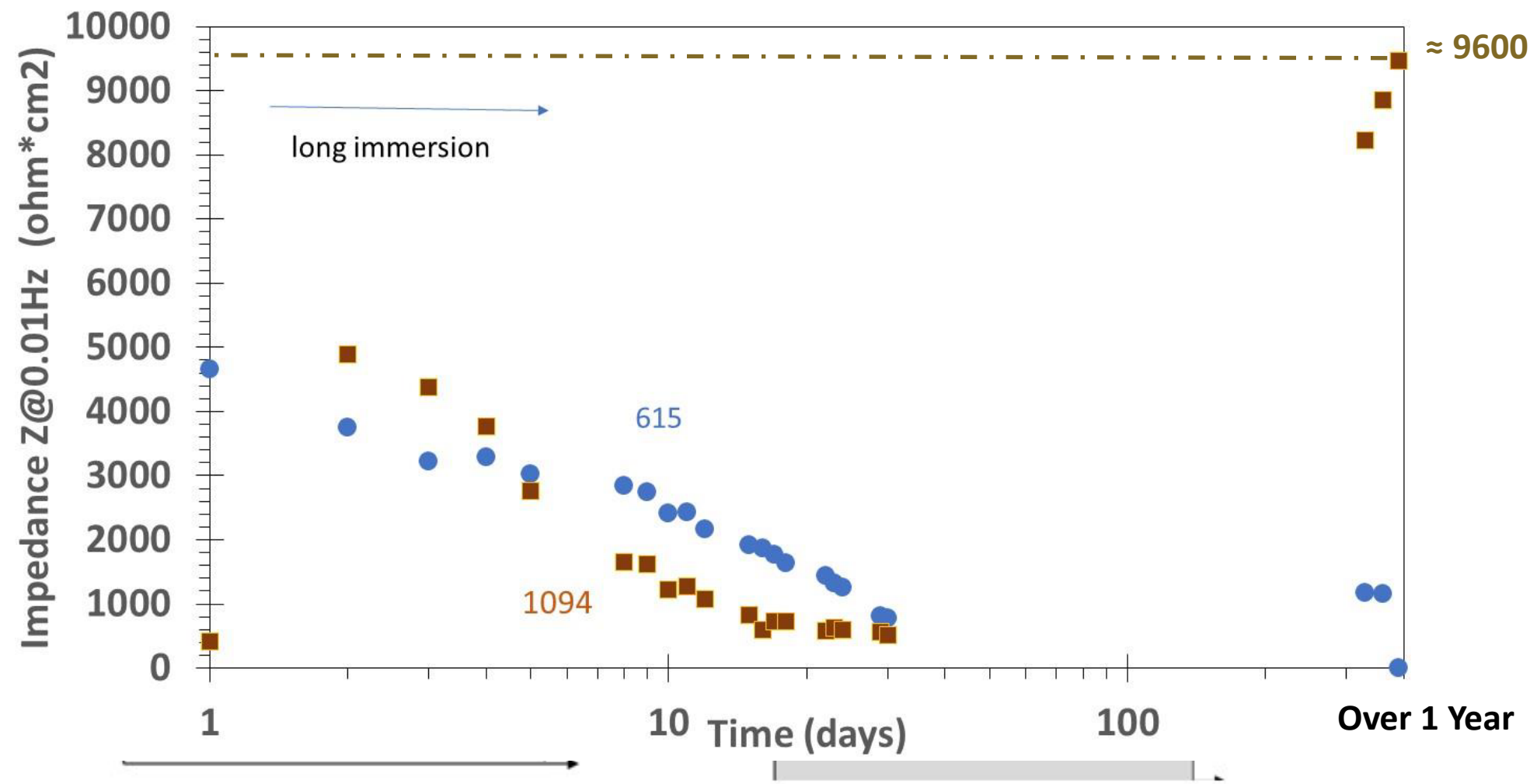




# Continuous Immersion Test for A767



# Continuous Immersion Test for A1094



# Texas A&M Research Summary



Improvements For A1094 compared to A767 in all tests conducted

Less expansive corrosion products

Relieves stress, allowing less chlorides to reach the rebar

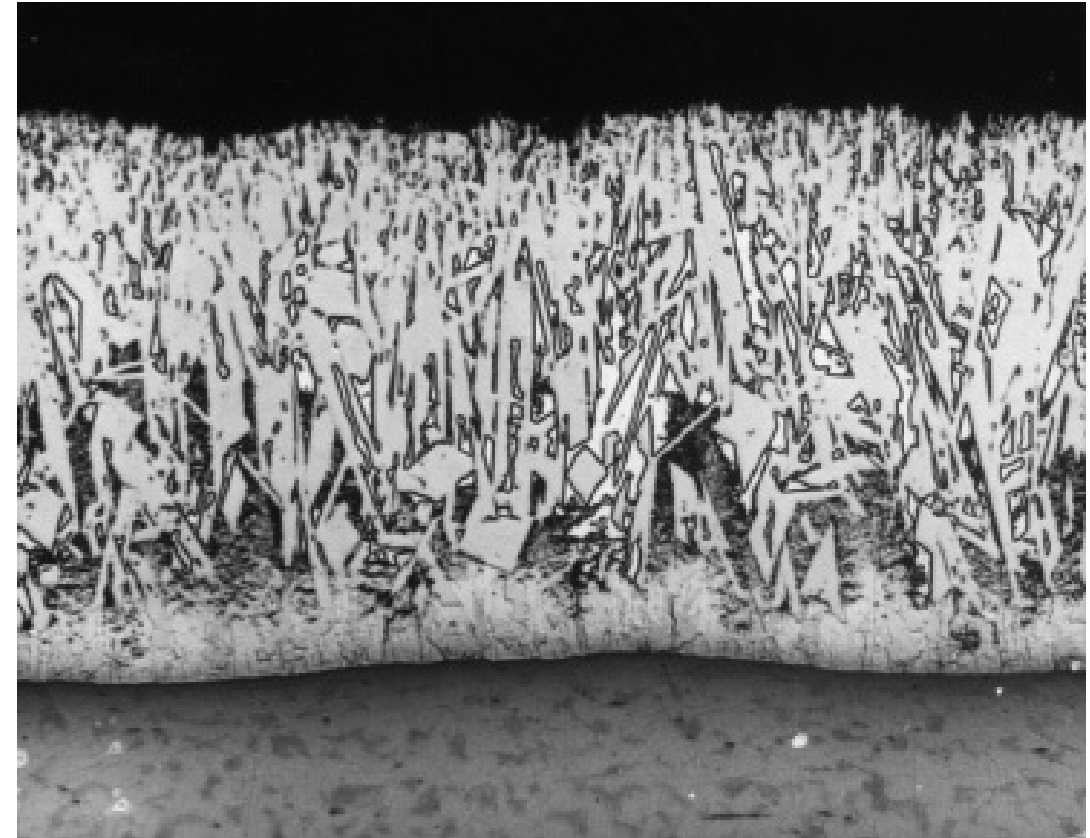
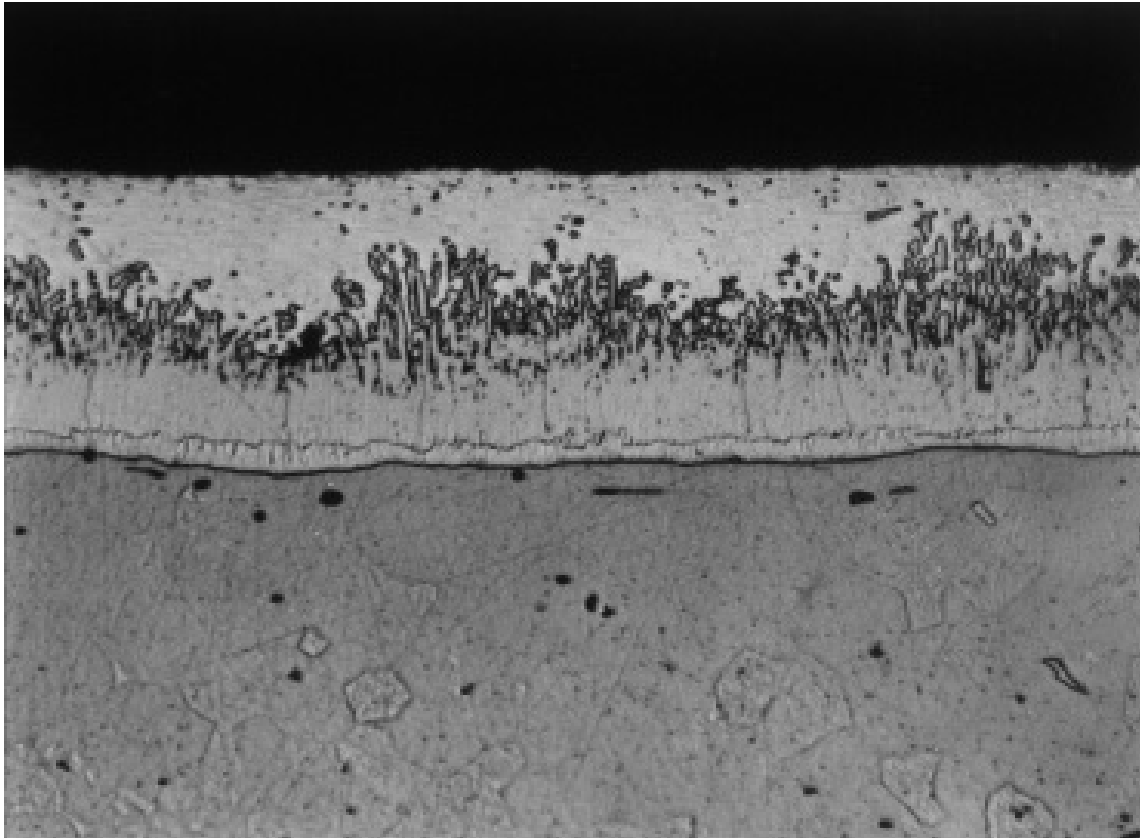
Slower Corrosion Rate

Major improvements in Resistance to Corrosion Rate

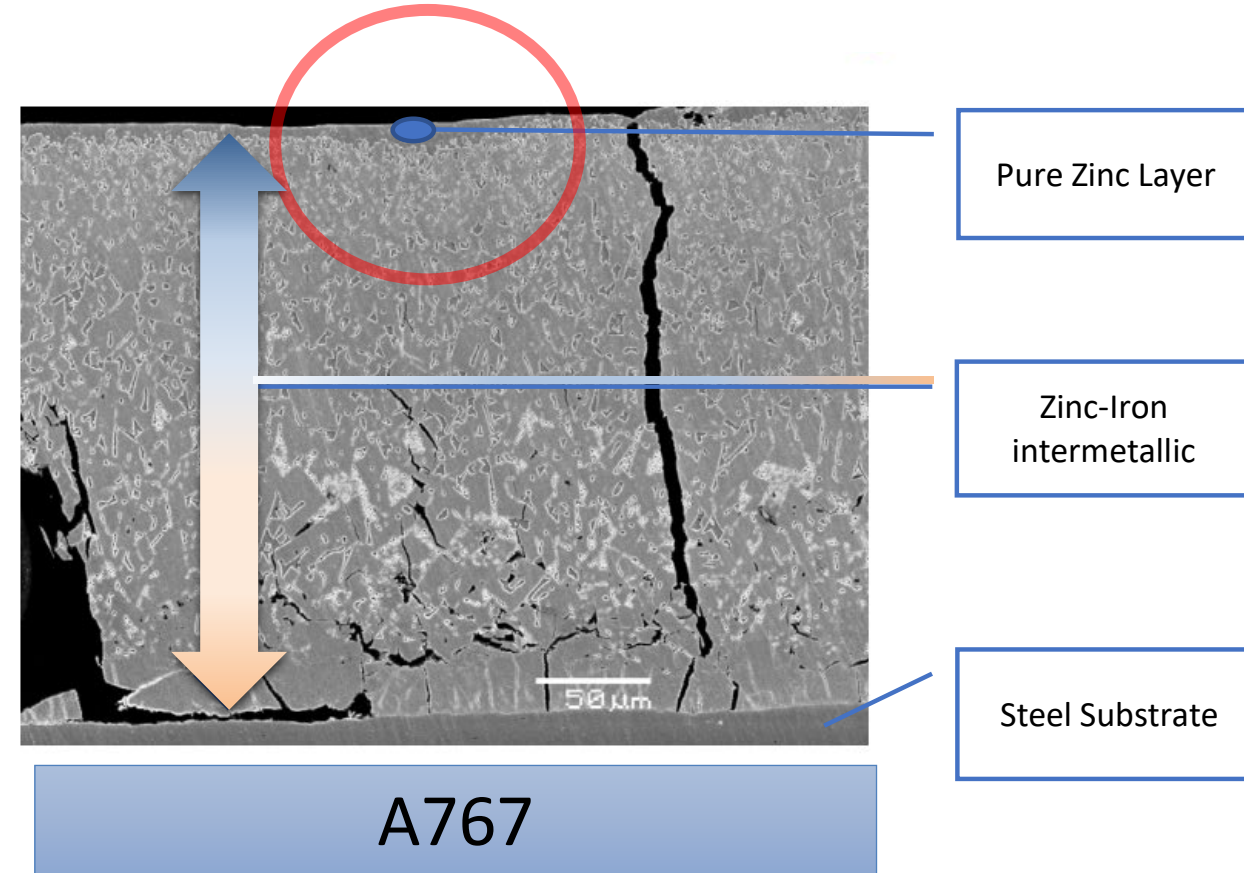
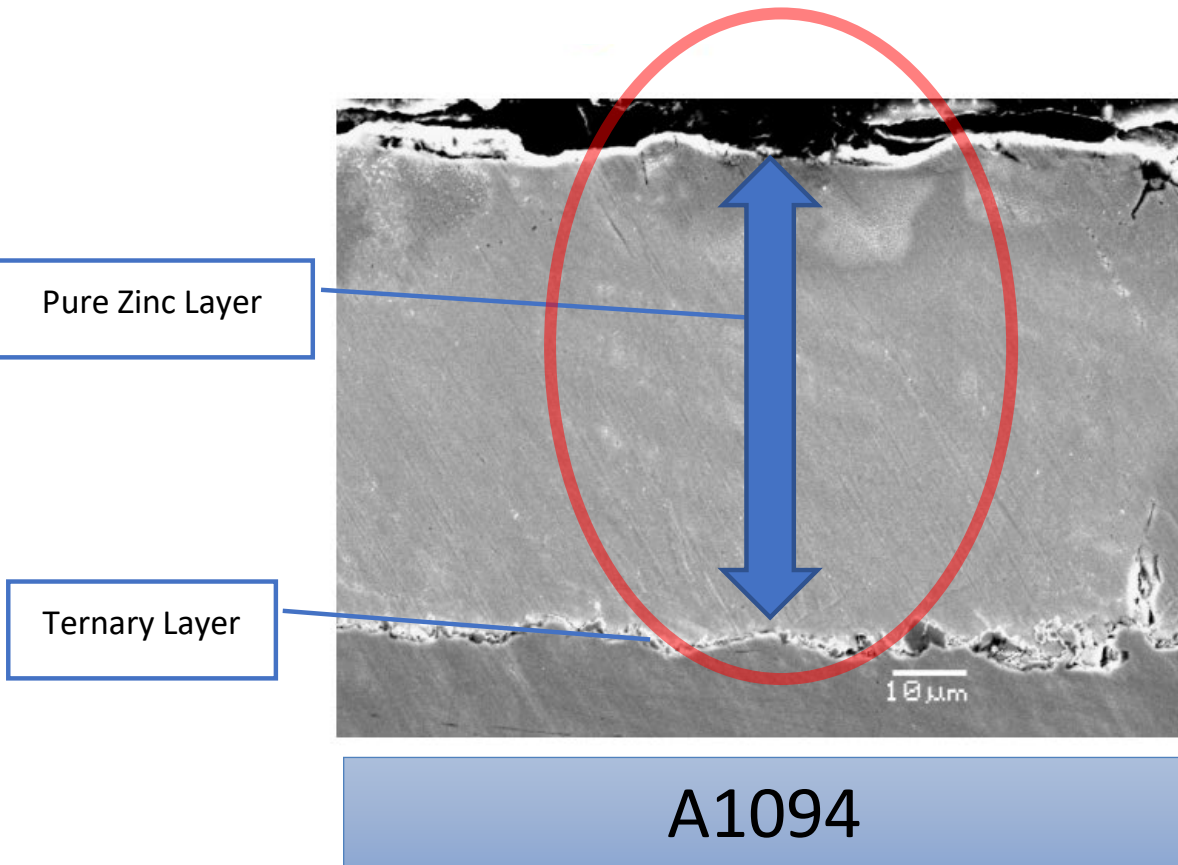
Paper will be released with thorough details of the Mechanistic performance of A1094



# A767 Photomicrographs



# Pure Zinc (A1094) & Zinc – Iron Intermetallic (A767)





## *Comparing ASTM A1094 vs ASTM A767 Research*



Excellent corrosion performance study - Texas A&M Dr. Homero Castaneda/ Tran-SET

Thicker pure zinc Layer - Yeomans, renowned galvanized rebar and concrete chloride research



Larger reduction in bridge deck cracking and corrosion - Patnaik University of Akron/ ODOT

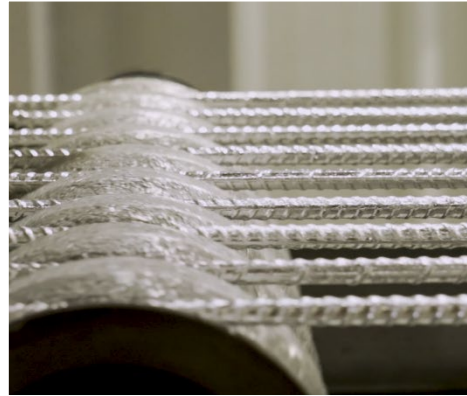
Equal or better corrosion performance of reinforcing bar - University of Kansas

# Procurement Chain

*Availability & Logistical Advantages*



Utilization of current  
Supply Chain



Processed prior to  
fabrication



#3 to #11 staged in  
stock lengths



No additional  
handling



# Conclusion

*A1094 is Equivalent or better than A767*



Proven protection – As demonstrated

Equal status in DOT specifications

Supply Chain improvements

Innovative process – processed prior to  
fabrication

Lowest cost of ownership for the life of critical  
infrastructure

THANK YOU

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