Developing New Stainless-Clad Steel Rebar

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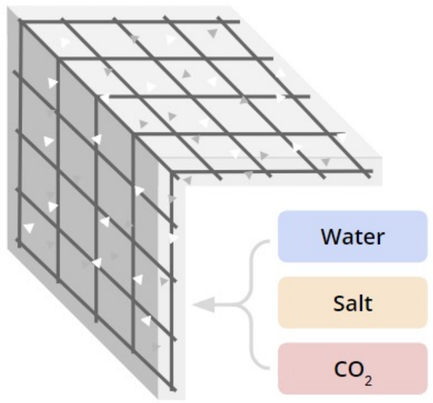
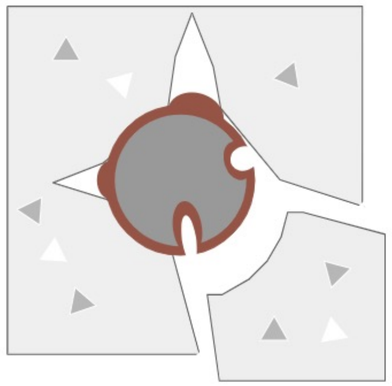
The Rebar Corrosion Challenge

Environmental exposure of concrete drives rebar corrosion



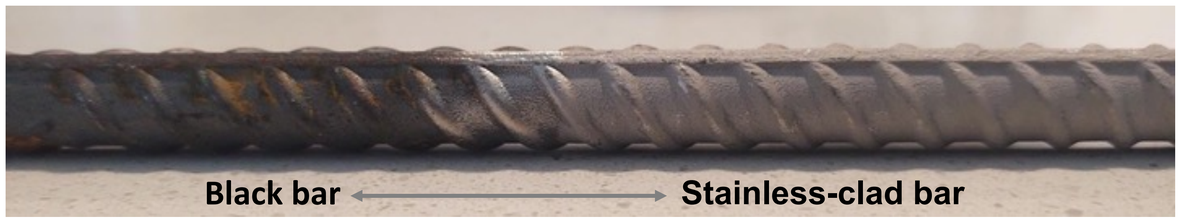
Corrosion weakens the steel rebar, expands and breaks the concrete



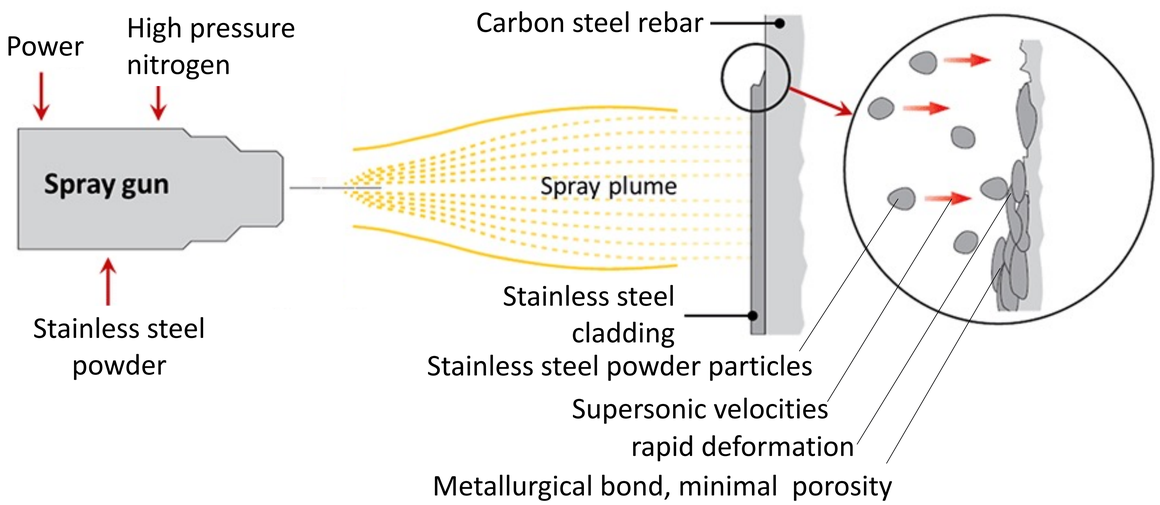
Rebar corrosion often determine the lifetime of concrete infrastructure, and limits the average bridge deck life to only 30-40 years. [1]

Solution: stainless cladding with cold spray technology

A thin stainless cladding is added to carbon steel rebar protects against corrosion

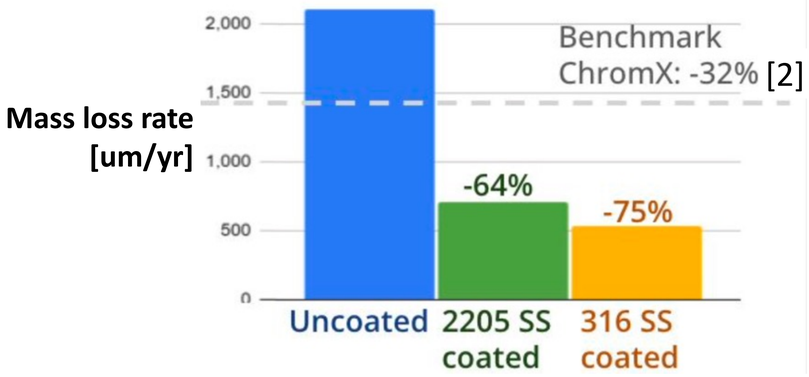


Commercial Cold Spray technology produces dense, durable stainless cladding



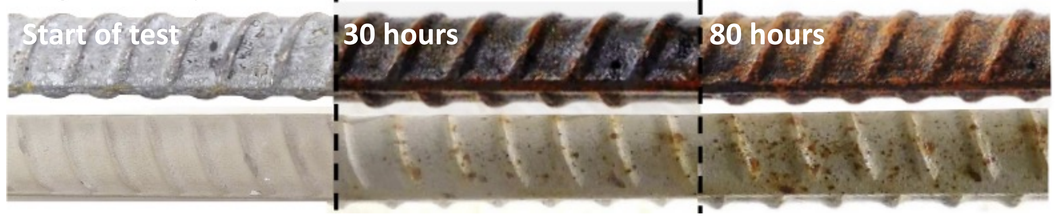
Experimental Results

Accelerated corrosion testing shows significant reduction in chloride corrosion



Data shown from salt spray testing of using:
- ASTM B117 test
- mass lost after removing corrosion
- 4-week test period

Images from cyclic immersion in 3.5% NaCl solution (ASTM G44)



Annealing enables coating to survive 90-180 deg bending without cracking

Future Work

- **Macrocell corrosion testing in simulated concrete is underway**
- **A 1+ ton manufacturing pilot is planned with a US-based steel mill**
- **In-concrete corrosion and structural testing is planned with university labs**
- **Pilot projects including bridges are a key future goal**

Acknowledgments

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References

[1] H.G. RUSSELL, Concrete Bridge Deck Performance, Washington, DC, 2004.

[2] F. Cui, E.I. DuPont, P.D. Krauss, S. Humphreys, Corrosion resistance of alternative reinforcing bars: An accelerated test, NACE - Int. Corros. Conf. Ser. (2008)