

What the innovation is:

Microcomposite (MMFX 2) Steel is an uncoated, highly corrosion resistant steel-reinforcing product that meets or exceeds the mechanical properties of ASTM A615 Grade 75 steel bars, resulting from both its chemistry and manufacturing production process.

Why it is innovative:

MMFX 2's rebar can be designed for a maximum design yield strength of 80 ksi as ASTM A615 Grade 75 rebar in accordance with ACI 318-02 for flexural and compression members in reinforced concrete structures, allowing a potential 20% material quantity reduction in comparison to conventional reinforcing materials. MMFX 2 rebar also offers potential additional construction costs savings when used in conjunction with High Performance Concrete (HPC) with high design strengths.

MMFX 2's corrosion resistance has been reported at between 5 and 9 times that of conventional A615 rebar, as tested at Virginia Transportation Research Council (VTRC) and Texas A&M University – Texas Engineering Experimental Station (TEES). Since the material itself provides the corrosion resistance, field installation can be simplified in comparison to other corrosion resistant rebar products, as MMFX 2's monolithic composition means that: 1. Field handling will not damage MMFX 2 rebar as can occur to coated products requiring field touch up of field damaged coatings as noticed by the special field handling requirements for both epoxy and stainless steel clad coated rebar products, 2. Standard field rebar fabrication procedures are possible with MMFX 2 vs. special requirements for offsite cutting and bending of (epoxy, clad, and galvanized) coated products and special requirements to place protective end caps for clad products, and 3. No special field erection safety hazards exist for MMFX, as can occur on potentially wetted, slick epoxy coated surfaces or sharp protrusions associated with galvanized rebars.

What it changed or replaced:

MMFX 2 steel rebar has fundamentally changed the way the construction industry views concrete re-inforcement, by economically eliminating the need for (epoxy, clad, and galvanized) coated reinforcing steel products for corrosion protection, while at the same time reducing the amount of reinforcement required through its high strength.

Where and when it originated, has been used, and is expected to be used in the future

MMFX Technologies was formed to commercialize over 25 years of research and development conducted at the University of California, Berkeley, in the field of nano- / micro-technology. The US Department of Energy sponsored much of the early research at University of California - Berkeley. Since MMFX's formation in June 1998, it has made significant advancements in the field of strong, tough, and corrosion resistance steels, especially for concrete reinforcement, and has subsequently been granted US Patent No. 6,273,968 B1 – August 14, 2001 Entitled: "Low Carbon Steels of Superior Mechanical and Corrosion Properties and Process of Making Thereof" for its Microcomposite (MMFX 2) Steel.

MMFX has acquired and developed methods and processes that are able to control material properties at the atomic level. The company calls this process "design by first principles," because the materials are designed on the atomic level with aid of the electron microscope. MMFX is able, using these material design tools, to obtain the most advantageous properties through their most optimal microstructures. Using these technologies, MMFX has the ability to fundamentally design high performance materials at the nano or micro level resulting in materials that significantly outperform existing products, and often cost less than similar materials present in today's marketplace.

In the future MMFX Technologies will use its "design by first principles" methodology to develop additional high performance steel and other metallic commercial products for use in construction (i.e. pipe, plate, strand, fasteners etc.)

Contact: Greg Kusinski Ph.D. • MMFX Technologies • 2 Corporate Park • Suite 102 • Irvine, CA 92606
866-466-7878 • Fax 949-474-1130 • greg.kusinski@MMFX.com

MMFX Technologies – Nova Award Nomination - Microcomposite (MMFX 2) Steel Rebar

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**SHEET 3 “Innovation Illustration”:
Microcomposite (MMFX 2) Steel Rebar**



**Iowa Bridge Deck
Uses MMFX 2 rebar's
Corrosion Resistance Properties**



**Florida High Rise Shear Walls
Use MMFX 2 rebar's
High strength Properties**