

The Development of NanoStructured Steel From Basic Discovery To Mainstream Technology

Daniel James Branagan, PhD
Institute of Nanomaterials Research & Development
The NanoSteel Company

ABSTRACT

Steel is one of the oldest materials known to mankind and has been used for at least 3,000 years. While modern society utilizes many types of advanced materials, steel can still be considered the backbone of industry and often the material of choice due to its combination of superior properties including its ease of manufacturing, ability to be recycled, its availability, and relatively low price. Over its history, driven by its importance to society, steel has been extensively studied and more is known about steel than any other class of material with more than 25,000 different records of steels in 51 different ferrous groups. It has been understood for decades that if nanostructured steel could be developed that it would offer improved combinations of properties but it has not been known until very recently how to achieve this on an industrial scale. At The NanoSteel Company, we have focused on bringing *new developments in nanomaterials from basic discovery to mainstream technology* enabling the achievement of nanostructured steel products in an ever increasing array of industrial processing techniques and commercial application strategies in the thermal spray and hardfacing areas. The realm of demonstrated properties which will be discussed include developing steel alloys which have the hardness of alumina ceramics, the wear resistance of hardmetals, the strength of carbon based fibers, the strength to weight ratio of titanium alloys, and the corrosion resistance of nickel based superalloys. We will show that the foreseeable future of materials nanotechnology may not be programmable assemblies, replicators, and swarms of nanomachines acting in unison, as some have suggested, but is instead the mainstream; i.e. the bulldozer, the mining crusher, and the automobile.