Non-Magnetic, Tough, Corrosion- and Wear-Resistant Knives
From Bulk Metallic Glasses and Composites

High-performance knives are used in hunting, fishing, sailing, diving, industrial, and military applications.

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Quality knives are typically fabricated from high-strength steel alloys. Depending on the application, there are different requirements for mechanical and physical properties that cause problems for steel alloys. For example, diver’s knives are generally used in salt water, which causes rust in steel knives. Titanium diver’s knives are a popular alternative due to their salt water corrosion resistance, but are too soft to maintain a sharp cutting edge. Steel knives are also magnetic, which is undesirable for military applications where the knives are used as a tactical tool for diffusing magnetic mines. Steel is also significantly denser than titanium (8 g/cm³ vs. 4.5 g/cm³), which results in heavier knives for the same size. Steel is hard and wear-resistant, compared with titanium, and can keep a sharp edge during service. A major drawback of both steel and titanium knives is that they must be ground or machined into the final knife shape from a billet. Since most knives have a mirrored surface and a complex shape, manufacturing them is complex. It would be more desirable if the knife could be cast into a net or near-net shape in a single step.

The solution to the deficiencies of titanium, steel, and ceramic knives is to fabricate them using bulk metallic glasses (or composites). These alloys can be cast...