

NORPLEX MICARTA

High Performance Thermoset Composites

Thermoset materials used to meet aesthetic requirements of pool cues that can cost hundreds or even thousands of dollars.

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Pool cues come in many varieties, ranging from inexpensive products sold by chain discount retailers to more expensive, upscale versions that offer top-of-the-line performance and sleek design. High-end pool cues consist of multiple segments, each segment with its own set of specific material requirements. For example, the segment near the tip of the cue must be strong enough to withstand repeated impacts with billiard balls while the segment at the opposite end must absorb impacts when the cue is dropped on the floor or into a rack. Middle segments are adorned with decorative materials, such as ebony and ivory, in special patterns and designs.

The materials used to produce high-end cues must be easy to machine with conventional equipment. This is especially important for the materials used to make the decorative segments of the cues, as intricate patterns on these segments can require a variety of machining operations.

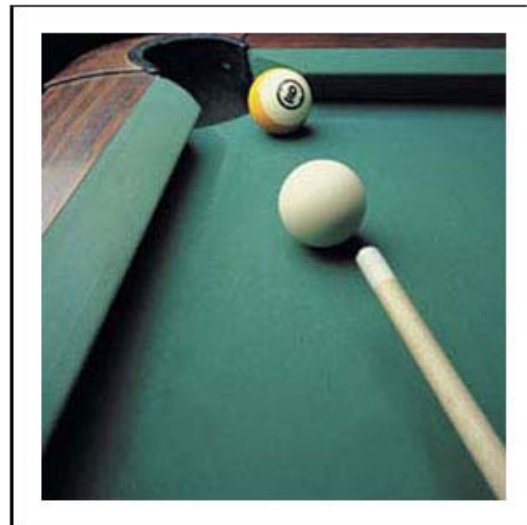
This article will describe how thermoset composite materials are used to meet the requirements of top-of-the-line pool cues. It will highlight thermoset tube, rod and sheet materials that offer the performance and manufacturability sought by makers of high-end pool cues. The article will also demonstrate how thermoset materials are used to meet aesthetic requirements of these pool cues, which can cost up to hundreds or even thousands of dollars.

Support For The Tip

At the tip of a high-end cue is a piece of leather that is glued to the ferrule, a short segment that absorbs repeated impact loads when the tip strikes billiard balls during a game. Many ferrules are small-diameter tubes made of linen-based thermoset composite materials with epoxy or melamine resin. These materials are high-strength and provide the impact resistance needed to keep ferrules intact during the long life of an expensive cue.

By contrast, the tips of many low-end cues are supported by thermoplastics that will eventually start to crack under the stress of frequent and long-term use. These thermoplastics cost slightly less than thermosets, but the longer product life provided by thermosets more than offsets the higher material cost.

Easy to machine with conventional equipment, the thermoset rod material accommodates manufacturing operations such as drilling and tapping



The segment near the tip of the pool cue must be strong enough to withstand repeated impacts with billiard balls.

which are performed so the rod will accept a threaded metal piece that attaches the ferrule to a longer wooden segment of the cue. The thermoset material is also compatible with epoxy and wood glues used to attach leather tips to ferrules. In addition, the thermoset's low moisture absorption ensures that the ferrule won't swell during prolonged exposure to the atmosphere.

Bolstering The Butt

At the other end of the cue, a rubber bumper is attached to a segment called the butt. Like the ferrule, the butt must be strong enough to handle many impact loads over the life of a cue. In this case, however, the impacts occur when the cue is dropped on the floor or into a rack.

As they do at the tip, thermoset composites meet the strength requirements at the butt end of the cue. The combination of linen and epoxy or melamine resin can handle repeated impact loads better than the wood or thermoplastic used to support the bumpers of low-end cues. These materials are more susceptible to breaking over time, which might require replacement of the butt or the entire cue.

Most butts are made of thermoset tubes that are relatively easy to machine with common tools. Like ferrules, these tubes must be drilled and tapped so they will accept a threaded metal insert that attaches the butt to a wooden cue segment. Thermoset rods sometimes take the place of tubes to accommodate metal inserts with smaller diameters.

Aesthetic Considerations

Common materials used to make butts and ferrules must be capable of assuming the appearance of pricey materials that are sometimes part of expensive cues. Thermoset composites meet this requirement, taking on the look of ebony and ivory that can be 10 times more expensive.



High performance thermoset composite materials like the Norplex-Micarta RTB320D and RTB329 are used to make butts and ferrules of expensive-looking pool cues.

Since ferrules are always white, those made of thermosets are often put through a dyeing and polishing process that will produce a look very much like that of ivory. Butts, on the other hand, are sometimes a deep black that resembles ebony. To help produce a similar look, thermoset suppliers will dye a linen tube black and then treat the material with a black resin to produce a rich black color. After machining and polishing, this so-called "double black" thermoset tube closely resembles butts made of ebony.

There are also other segments of high-end cues that sport decorative designs that help attract buyers. These detailed designs are created using a number of different techniques. For example, a manufacturer might cut intricate shapes into an ebony-colored rod, then glue small pieces of ivory-colored material into the cuts to create an inlay pattern.

In many cases, the pieces used to create these patterns are cut from sheets of thermoset materials. Measuring 1/8" or 1/16" thick, these thermosets are often paper based materials with epoxy resins, which provide greater stability than phenolic resin alternatives. The thermosets are easy to machine into the shapes needed to make inlay sections. In addition, the thermoset pieces created for inlay designs will not crack or break when subjected to vibration and other types of loads that travel

through cues when used.

Nobody's Behind The Eight Ball

Both buyers and sellers of high-end billiard equipment win with cues that feature thermoset composite materials. Thermoset materials are strong enough to provide the impact resistance needed at both ends of the cues, but are also easily machinable with common tools. In addition, thermosets can be effective stand-ins for ebony and ivory, providing the attractive look sought by many serious pool players, but at a fraction of the cost of the valuable materials that often adorn the most expensive cues.