7.2.2 Fret materials

The material most often used for frets is German silver (nickel silver, white copper, argentan, alpakka[§]). The precious metal silver is not contained in this material, though – or only in traces. German silver is an umbrella term for copper/nickel/zinc-alloys that could also be termed "highly nickel-alloyed special-brass". The pure copper-zinc alloy is called **brass**; it is used as material for frets, as well, albeit rarely. By itself, copper is of a reddish color, adding zinc results in yellowish hue, and nickel moves the coloring towards the greenish and on into the silver-white area – thus the name nickel-silver. The addition of nickel and zinc particularly adds to the hardness – that should be high anyway because the contact to the steel strings wears down the frets during play. Also, nickel makes the fret more resilient against tarnish and corrosion. The high nickel content of >30% required for the silver-white color is not found in guitar frets, though: customary is a nickel additive of 12% (acoustic classical guitar), or 18 % (electric guitar). More recently, steel has also become popular as a material used for frets. No problems or issues have been reported – steel seems to be well suited for this application.

Due to the direct contact to the strings, the frets have a sound-determining function, and thus we do find a wide range of materials and shapes. Besides German silver, bell brass should be mentioned – another copper alloy, but with tin as additive rather than zinc. The silver-white bell brass contains about 77 – 80% copper with the rest being constituted by tin. Relative to German silver, bell brass tends to corrode more easily but this rarely poses a problem. Despite the fact that tin is a soft metal, Cu/Sn-alloys reach a similar hardness as German silver.

The **dimensions** of the frets visible to the guitarist are width and height of the tip of the fret. Small frets (often found on vintage guitars) have a width of between 1 mm and 1.7 mm, and a height of 0.6 mm and 0.8 mm. Medium size would be $B = 1 – 2.6$ mm, and $H = 0.7 – 1.1$ mm, while large (jumbo-) frets would measure $B = 2.6 – 3$ mm, and $H = 0{,}9 – 1{,}5$ mm.

The **nut** is fabricated from bone, or from a special low-friction plastic, or in some cases from metal. There is no limit to the imagination of the manufacturers when coming up with designations: Vintage Bone, Bonoid, Ebonol, Graphite, Graph Tech, TUSQ, to name but a few. Much attention is paid to the low-friction aspect because the strings need to slip through the nut free of any hysteresis while they are tuned or bent. Static friction prohibits this slip to some degree and creates a zone of lacking discrimination. Roller-nuts promise a particularly low friction; however, they are wider than regular nuts and not necessarily easy to install. The string should find a firm but still almost frictionless bearing in the notch (or groove) of the nut. Well suited are v-shaped nut-notches that offer a small seating towards the headstock and end abruptly towards the side of the fretboard. Shape and depth of the groove of the nut are carved into a blank nut-piece using a **nut-file**. Also worth mentioning is the clamping nut that however requires fine tuners at the other end of the string.

Frets and nut are rounded off at their sides so as not to hurt the hands and fingers of the guitarist – a fact that is less relevant to guitar-physics but more to accident-prevention regulations, practices of law, and pathology. Still, a connection to physics may be made: the dimensions of wood are humidity-dependent while the dimensions of fret-material are not (i.e. not fretted by it …☺). If in winter you suddenly feel the ends of the frets on your guitar: file them off, or see to a higher humidity of the air!

[§] inconsistent spelling. N.B.: Alpaka = Lama.

