Why Does Hardness Matter in Jewellery Alloys?

The hardness of any metal or alloy gives a guide to its durability and ability to form and hold a shape. A common method of measuring hardness is the Vickers Hardness test; where a diamond, cut in a pyramidal shape, is pressed into the metal's surface. The smaller the impression left by the diamond, the harder the material and the greater the quoted hardness value - Vickers Hardness value is shown as HV or DPH (Diamond Point Hardness). Steels have typical values of 450HV/DPH, soft pure silver has a value of 30HV/DPH and for traditional sterling silver has a hardness range of 75HV/DPH (in the fully soft condition) to 150HV/DPH (in the fully hard condition) - these are the documented values agreed by the major manufacturers.

Pure silver is too soft (at 30HV/DPH) to withstand any handling damage. In its fully hard condition of 100HV/DPH, it has no ductility and will not form a shape without breaking. Historically, copper was added to silver to increase its hardness. At the 7½% copper level (i.e. sterling grade), sheet in the ¼ hard to ½ hard (100HV/DPH to 120HV/DPH) condition, has sufficient hardness and ductility to withstand handling damage and form complex shapes.

If the copper content is replaced with quantities of tin or zinc, then the hardness levels fall (to 55HV/DPH in some cases), resulting in softer alloys with a greater tendency to be damaged in handling. To counteract this, manufacturers can form pieces from ¾ hard or fully-hard sheet, however, this sheet has limited ductility and can only form the simplest shapes.

By replacing a small amount of the copper content found in traditional sterling silver alloys with germanium, Argentium® Sterling Silver has made use of a property, usually associated with highly engineered aluminium alloys used in the aerospace industry - that of precipitation hardening.

Put simply, Argentium® Sterling Silver can be formed into complex shapes in its fully soft condition (65HV/DPH), then by means of heat treatment in air, at temperatures achievable in a domestic oven that result in no distortion to the piece, have its hardness increased by means of a change in the atomic structure of the metal. This is precipitation hardening; usually found in only the most complex alloys used in specialised applications. This allows Argentium® Sterling Silver to achieve a hardness up to 125HV/DPH for the finished article, allowing both excellent formability in manufacture and lasting quality in use, with its resistance to handling damage. A simpler heat-hardening procedure that does not require quenching the metal (as traditional precipitation hardening), can be applied to Argentium® Sterling Silver - this process increases hardness up to110HV/DPH.

Charles Allenden

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