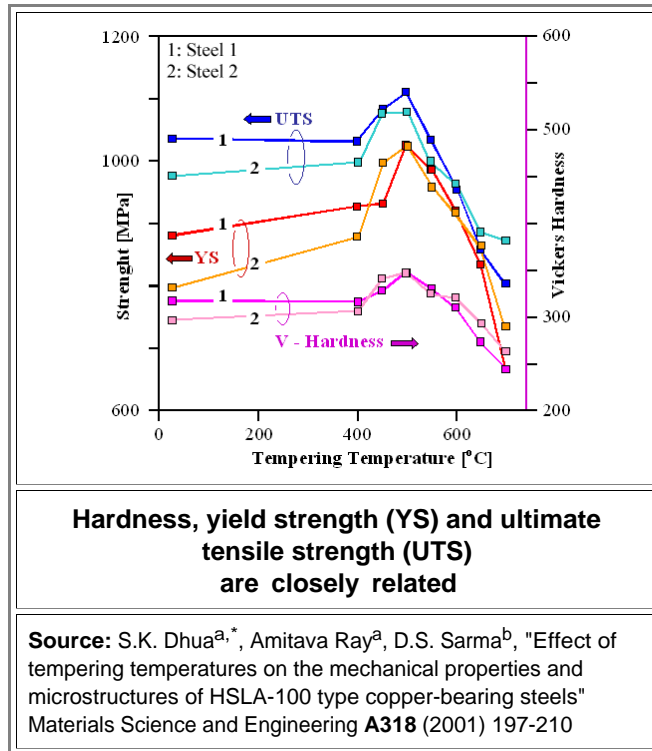


Yield Strength and Hardness

Illustration

The claim is that yield strength and hardness measure more or less the same property of metals: the onset of plastic deformation.

- Here is the "proof". A series of real measurement taken from some more or less randomly selected publication about some steels.



- The relevant data are:

- Specimen:** The two steels are "high-strength low-alloy" steels (HSLA) with slightly different concentrations of alloying elements.
- Tempering** in this context means that the samples were held at different temperatures ranging from 400–700°C for 1 h, followed by quenching in water. Then tensile tests and hardness measurements were done.
- Why this procedure changes the properties you will find out later; a taste treat can be found [here](#).
- Of course, you can also read the paper, [here is the link](#).

If we look very close, hardness is not just related to the yield stress YS but also to the ultimate tensile strength (UTS); the correspondence might even a bit better than to the yield strength.

- It doesn't matter much, however. As long as the relation between UTS and yield strength is roughly constant (as in the picture above), a hardness measurement is good enough. If it's not, you simply can't describe the material very well with just giving single numbers.