

What Status of Metals is Expressed by The Tensile Testing Result at A Temperature and Strain Rate?

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Abstract

The review of literature [1] stated an integrated new technological system of tensile testing in metals and the corresponding new concepts of metallic mechanics. A bran-new appearance of metal mechanics is emerged at the international community of science and technology. It is uncovered that since the time of Galileo the results of tensile testing at a temperature and strain rate have been incorrectly interpreted as the original mechanical properties of specimens possessed prior to the testing, thereby forming a paradox, such as shown in paper [2].

It was pointed out in 2011 by the Technical Committee Mechanical Testing of Metals, ISO/TC164, that the variations in temperature and strain rate in tensile testing had been found to exhibit an apparent effect on the results, contributing uncertainty unrelated to the test equipment, termed as the measurement uncertainty of tensile mechanical properties in metals. Reference [1] definitely verified that such a measurement uncertainty makes the testing results at a temperature and strain rate not to be the original mechanical properties of specimens in general and even being unaware of what status of tested metal expressed by the testing results. This is basic and vulgar mistake. Is still the metallic mechanics a science if such a fundamental mistake is retained?

Reference 1 experimentally confirmed that for two conditions A and B of a metal, the mechanical property of A will be higher than that of B under a strain rate of tensile testing but it may be lower than that of B under another strain rate at the same testing temperature. That shows the testing results at a temperature and strain rate have already no comparability in general meaning, not to reach qualitative compare between mechanical properties of metals.

What status of metals is on earth expressed by the tensile testing result at a temperature and strain rate? Just as shown in reference 1 that the tensile testing result at a temperature and strain rate is corresponding to a point on the “mechanical property -- tensile strain rate” curve to express the processing deformation property of the tested metals when processing-deformed with the corresponding strain rate, or the service mechanical properties of metals when the service time of the metal is equal to the elastic deformation time which the strain rate is correspond to. That is the physical meaning of tensile mechanical properties obtained at a temperature and strain rate. The existing theory of metallic mechanics cannot obtain such a physical meaning because no new micro-structure can be obtained under each tensile temperature and strain rate in tensile testing.

Reference 1 gave a method of measuring original mechanical properties that the faster the tensile strain rate is, the closer the property on the “mechanical property-tensile strain rate” curve is to the original mechanical property. There must be a strain rate which is fast enough to determine the original mechanical property of the tested metal on the “mechanical property-tensile strain rate” curve.

Therefore, call on: All colleagues in science community, paper authors. Editors of learned periodical should not understand the tensile testing results at a temperature and strain rate as the

original mechanical properties of the tested metals to mislead the science community and to give rise to the waste of social resource. It would be an academic misconduct if being full aware such a mistake to support still on purpose the publication of papers which include such mistake.

Keywords: Insist Science, Seek the truth, Drive progress!

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