



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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Hard metal -- Palmqvist toughness test

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard uses the translation method equivalent to ISO 28079.2009 "hard alloy Pap value toughness test".

For ease of use, this standard makes the following editorial changes to ISO 28079.2009.

- For ease of use, HV(P) in Chapter 3 adds N/mm² as a unit;
- Will be 6.2 W, corrected to WG;
- Added the note in Appendix A.

This standard was proposed by the China Nonferrous Metals Industry Association.

This standard is under the jurisdiction of the National Nonferrous Metals Standardization Technical Committee (SAC/TC243).

This standard was drafted. Xiamen Tungsten Industry Co., Ltd. (Technology Center), Xiamen Golden Heron Special Alloy Co., Ltd., Nanchang Cemented Carbide limited liability company.

1 Scope

This standard specifies the method for testing the Barcolage toughness of cemented carbide and cermet by indentation at room temperature.

This standard applies to the testing of metal-bonded carbides and carbonitrides (often referred to as cemented carbide or cermet).

The toughness is calculated by testing the total length of the cracks emitted from the apex angles of the Vickers hardness indentations. The test procedure proposed in this standard is usually

It is carried out at room temperature and can be extended to test at high or low temperatures if agreed. The test procedure proposed in this standard is used in the routine laboratory air ring.

Conducted in the environment; not in corrosive environments such as strong acid or seawater environments.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article.

Pieces. For undated references, the latest edition (including all amendments) applies to this document.

ISO 3878 Hardmetal Vickers Hardness Test Method (Hardmetals-Vickershardnesstest)

3 symbols and units

The following symbols and units apply to this document.

A. Constant 0.0028.

d. average of the indentation diagonal, mm.

D1, d2. single indentation diagonal value, mm.

E. Young's modulus, N/mm².

F. indentation load (toughness calculation), N.

G. strain energy release rate, J/m².

H. hardness, kgf/mm².

HV(P). Vickers hardness at load P (kgf), kgf/mm² or N/mm².

K_{IC}. Plane strain fracture toughness, MN/m^{3/2}.

L_n. crack length at the top corner of the indentation, mm.

P. indentation load (Vickers hardness method), kgf.

T. total crack length, mm.

T_n. the crack length from vertex to vertex, mm.

WG. Barcolt toughness, N/mm or J/m², 1 N/mm = 1000 J/m².

WK. Pap fracture toughness, MN/m^{3/2}.

ν. Poisson's ratio.

4.1 Sample size and sampling

This standard has no special requirements on the shape of the sample, as long as a flat and parallel set of tests can be prepared on the sample to meet the indentation test.

Sample (test surface and back). Pressurized hot inlays can produce parallel planes, while cold inlays cannot produce parallel planes.

Parallel sample faces are easily obtained with a diamond cutter or an electric spark cutting device. The surface of the sample after cutting should be polished. Suggest

A 0.2 mm thick material should be removed prior to final polishing to ensure a representative test surface. For example, cemented carbide Vickers hardness test mark

The standard (see ISO 3878) specifies the removal of 0.2 mm.

Note. The thickness of the test piece recommended in M. Heinonen (UNMIST) [19] is at least 10 times the crack length. Because the stress state of the sample depends on

For materials that support indentations and their cracks, too thin samples may not give representative results. Using a thermosetting resin inlaid sample, it can be square

A flat and parallel test surface is produced directly. However, the disadvantage is that it is subsequently subjected to an annealing treatment (usually heat treatment at 800 ° C in a vacuum)

1h) To eliminate surface residual stress, the sample should be taken out of the resin before

entering the annealing furnace.

4.2 Sample surface preparation

The flatness of the surface of the specimen is a basic requirement for the shape of the indentation. When testing, it can be confirmed by measuring the diagonal length of the Vickers indentation.

The flatness of the surface of the sample. If the difference in the length of the two diagonals of the indentation exceeds 1%, the surface of the sample is not flat, and the test result invalid.

In view of the fact that the silicon carbide grinding wheel introduces greater residual stress, the method requires a metal bonded 40 μm particle size diamond wheel.

The surface of the sample is ground in the presence of a grinding fluid. Then the grinding plane is polished, it is recommended to use at least three abrasive grains

Polishing, first with a minimum particle size of 30 μm diamond abrasive, followed by 6 μm and 1 μm polishing, the final stage needs to use no

flannel.

Note. If the final polishing stage is long enough to remove all damage from the flat grinding, this process can produce an unstressed surface. however,

It is difficult to prove the above situation because there is not a large amount of test data comparing only the polished and post-polished samples.

4.3 Surface condition of the sample

Stable test results require no residual stress on the sample surface (see Reference [8]). Polishing the method of stress removal requires a cumbersome system

Sexual measurements to ensure that the surface of the specimen is unaffected by stress is almost impossible in practice. Usually, the surface of the sample is polished to meet the micro

The metallographic structure of the structure was observed, and then the residual stress was removed by vacuum annealing at 800 ° C for 1 h according to Exner's research results [8]. If not

Testing with an annealed polished surface should be noted in the test report.

Note. New materials developed in recent years with finer WC particle size (measured by linear intercept method with a particle size of less than 0.8 μm)

There can be higher residual stresses. Eliminating the residual stress of these materials