

HARDNESS TESTING IN POWDER METALLURGY

Hardness testing in powder metallurgy requires completely different parameters and procedures compared to classic hardness testing applications. Samples have to be prepared well to enable the hardness test. Powder has to be embedded in resin, e.g. with a hot mounting press, and afterwards the materialographic specimen has to be polished to obtain a clean surface for hardness testing.

Test procedure and test methods

Non-ferrous material is usually tested with Brinell or Vickers test methods – depending on the work piece and application with test forces between 2.5 and 1000 kg. The requirements for testing of powder materials are very different: the small particle size (<0,1 mm particle size) requires very low test forces and small indent diagonals which are possible with Vickers test methods only. For the Aluminum powder in

our example we expect an estimated hardness of 25 to 35 HV which means results of test forces higher than 15 g (HV0.015) may already correspond to Vickers DIN EN ISO and ASTM standards (standard requirement: Vickers indent diagonal >20 µm). If the hardness tester is able to execute even lower test forces, the testing is also possible on smaller particles (but not according to standard).

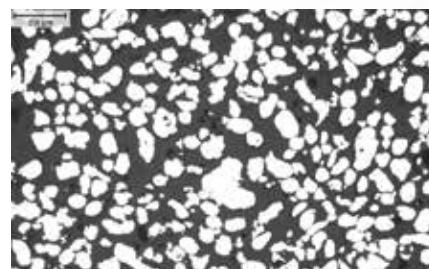


Fig. 1: Embedded Aluminum powder / polished surface / 4x microscope lens
Powder particles polished down to half of the particle size or big particles are suited best for hardness testing with meaningful results.

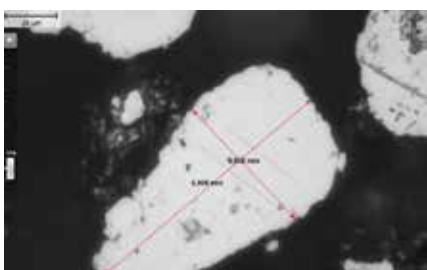


Fig. 2: Size of an aluminum powder particle measured in hardness testing software (40x lens)

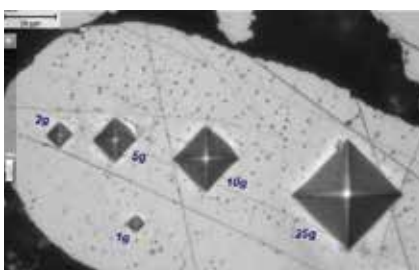


Fig. 3: Comparison of Vickers indent sizes: HV0.001, HV0.002, HV0.005, HV0.01 and HV0.025 – Test forces between 1 g and 25 g

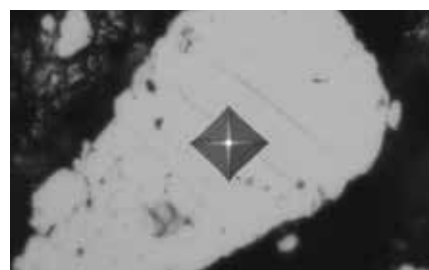


Fig. 4: Hardness result: 30.3 HV0.005 tested in the middle of the cross section of the aluminum particle

QNESS – HARDNESS TESTING

QNESS is focused on the development and manufacturing of innovative high-end products for hardness testing. In addition to the wide range of versatile standard machines, QNESS is also specialized in the planning and realization of customer-specific solutions.

- Micro Hardness Testers
- Rockwell Hardness Testers
- Universal Hardness Testers
- Clamping Fixtures
- Customized Hardness Testers
- Fully Automatic Hardness Testing Plants

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QNESS SOLUTIONS FOR ADDITIVE MANUFACTURING

Requirements for hardness testers in powder metallurgy

- Low Vickers test forces
- High accuracy in slide and turret movement
- Optical measurement system with high contrast at large magnification
- Simple operation
- Structured result management and reporting

Conclusion

For proving the quality of powder materials a powerful Vickers micro hardness tester like the QNESS Q10/30/60 is needed. Depending on the amount of tested samples either the simple semi-automatic "M" version or the professional fully automated "A" or "A+" models are the perfect choice for powder material applications. Depending on the test force and the surface preparation, the hardness testers are even able to use the integrated automatic image evaluation next to automatic brightness and focus adjustment. Reporting tool and export functions permit the creation of test protocols or data export to data management systems.



Micro Hardness Tester Q10 M



Semi-automatic Q10 M Vickers hardness tester for effective manual hardness testing at powder materials. Possible test forces between 0.25 g and 10 kg

- Exact positioning and large test room
- 6-fold measurement turret
- Dynamic height adjustment

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