

The number of grains outside the circle (n_2) = 26
 Planimetri factor (f) = 8

Area of a circle

$$A = \pi \cdot 39,9^2 = \pi \cdot \text{mm}^2 = 1592.01 \text{ mm}^2$$

Number of grains / mm²

$$N_A = f \left[n_1 \frac{n_2}{2} \right] = 8 \left[56 \frac{26}{2} \right] = 5824$$

A large number of granules (ASTM G)

$$G = [3,322 \log(N_A) - 2,95] = 9.558$$

3.2 Hardness

The sample is subjected to hardness test using Micro Hardness [3] in some points as mentioned below.

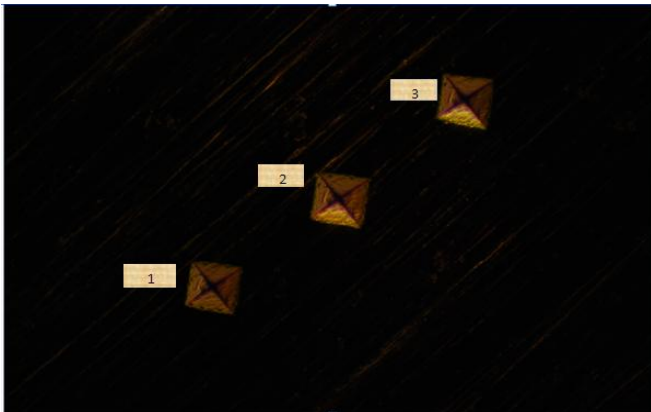


Figure 2: Observations on hardness with 200x Magnification

Each of tracking points was counted in hardness by using equations (1) and (2). Results were depicted as in Figure 5 and calculations were listed as in Table 2.



Figure 3: Measurement of observations

Table 2: The results of hardness

No	d ₁ (mm)	d ₂ (mm)	Kekerasan Vickers (HV)	Kekerasan Rata-rata (HV)
1	0.049	0.048	131.636	
2	0.052	0.050	116.561	123.503
3	0.048	0.052	122.320	

4. Conclusions

Trials suggest mean hardness is 123.506 HIV and experiment of grain represent sum of grain is 5824 grain/mm², and large number of grain based on ASTM E112 is 9.558.

References

- [1] M. Sadayappan, J.P. Thomson, M. Elboujdaini, G. Ping Gu, and M. Sahoo: Grain Refinement of Permanent Mold Cast Copper Base Alloys, The project was funded by US Department of Energy, 2004
- [2] Marcel Lucas and Elisa Riedo: Invited Review Article: Combining scanning probe microscopy with optical spectroscopy for applications in biology and materials science, American Institute of Physics, 2012
- [3] Janice Edwards: Hardness Testing, Characterization of Materials, 2012