3.8.4 Knoop Hardness Test

A rhombic pyramid as shown in the figure below is used as the indenter in this test. The included angle α of the pyramid is 72.5° and 130°.

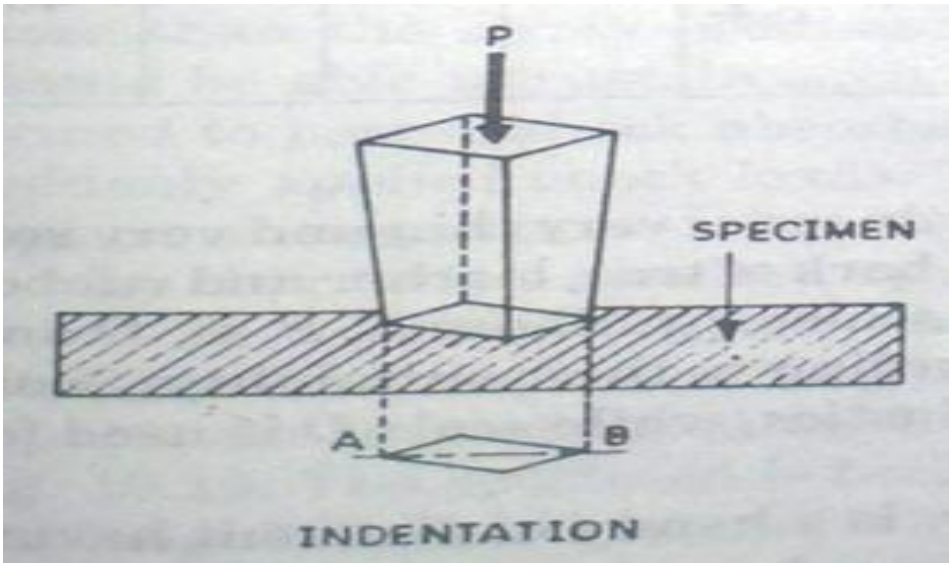

Fig3.8.4(a)b Rhombic pyramid indenter and its indentation in Knoop's test

Knoop hardness Number (KHN)

Knoop Hardness Number is determined from the following expression

$KNP = (14.229\ P)/d^2$

Where KHN – Knoop Hardness Number

P – Applied load (Kg)

D – Length of longer diagonal (mm)

Construction

Knoop Hardness Testing Machine consists of Knoop indenter tip ,anvil,high resolution optical microscope and other accessories to measure the impression.

Testing Procedure:

1.The diamond indenter is pressed into the surface of the sample.

2.The test load is maintained for a dwell period of time.

3.The indenter is removed after the dewell time.

4.The indenter produces an elongated diamond shaped image on the surface of the sample.

5.The hardness is determined by using

$$KNP = \frac{14.229\,P}{d^2}$$

Precautions:

1.Micro hardness require extra care in all stages of testing.

2.Good polishing of the surface is required.

Advantages:

1.The diagonals of the square indentation can be measured more accurately.

2.This method is suitable for hard materials as well as for soft materials.

Disadvantages and Limitations:

1.The accurate measurement of indenting size is very difficult and it requires high polished surface.

2.It consumes time for measurement.

3.The long diagonal of Knoop indentation is affected by elastic recovery for loads less than 300g.

Applications:

This hardness test is used for testing of materials such as wires ,springs, watches ,gears, tools ,tips ,plated surface, coatings, hardness of particular phase in micro structure etc.