

KES

Ring Analysis of Lubricating Oil

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1. Scope of Application

This standard shall be applied to ring analysis of Mineral Oil.

2. The meaning of words

The Ring analysis is the structural group analysis method using simple physical and chemical properties of Mineral Oil

Figure 1 is a example of the structural group analysis.

At this point, (a) is a chemical combination that is analyzed, (b) is a result of the Theory of Analysis.

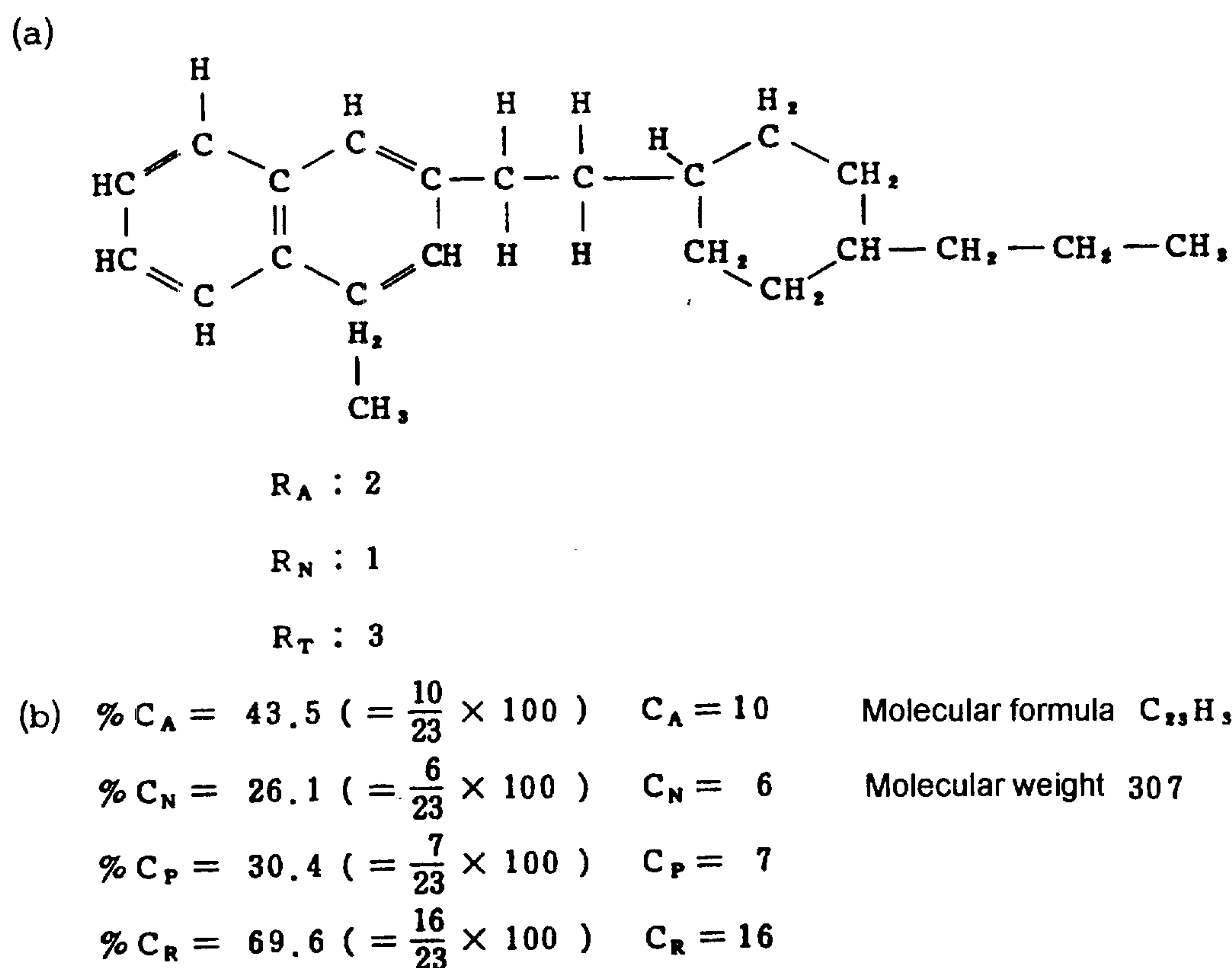


Figure 1 Example of the structural group analysis

At this point, the meaning of symbols that are indicated to the Theory of Analysis is flowed.

R_A : The number of a ring of aromatic that exists in the mean molecule

R_N : The number of naphthalene that exists in the mean molecule

R_T : The number of a ring of aromatic naphthalene that exists in the mean molecule

% C_A : Percentage (%) that divides the number of carbon in aromatic into the number of the whole carbon

% C_N : Percentage (%) that divides the number of carbon in naphthalene into the number of the whole carbon

% C_P : Percentage (%) that divides the number of carbon in paraffin into the number of the whole carbon

% C_R : Percentage (%) that divides the number of carbon in aromatic and naphthalene into the number of the whole carbon

3. Summary of Test Method

The Ring analysis is one of the methods of Lubricating oil structural analyses that analyzes structural group of lubricating oil(% C_A , % C_N , % C_R , % C_P , R_A , R_N , R_T) prepared formula or monograph from simple physical and chemical properties; a refractive index, specific gravity, viscosity, molecular weight etc.

4. Test Equipment

- (1) Refractometer
- (2) Gravimeter
- (3) Viscometer

5. ri-VGC Method (ASTM D 2140)

5.1 The portion of mater that needs to the ring analysis

- (1) Refractive index (n_D^{20})
- (2) Specific gravity (d_4^{20} , d_4^{15-6})
- (3) Viscosity ($\text{mm}^2 / \text{sec } 100^\circ\text{F}$)
- (4) S powder (wt%)

It is necessary to revise a computation when wt% exceeds 0.8%.

5.2 Scope of application

This method shall be applied to 200 ~ 600% molecular weight, and C_A 0 ~ 50 Oil.

5.3 Calculation of % C_A, % C_N, and % C_P

- (1) Calculate a refractive index factor from a refractive index and specific gravity.

$$ri = n_D^{20} - \frac{d_4^{20}}{2}$$

- (2) Calculate a viscosity VGC from a viscosity and viscosity limit.

$$VGC = \frac{G + 0.0887 - 0.776 \log \log (10 V - 4)}{1.082 - 0.72 \log \log (10 V - 4)}$$

At this point G : specific gravity at 15.6°C

 V : viscosity limit at 37.8°C (mm²/sec)

- (3) Calculate an intersecting point of ri and VGC, and % C_A, % C_N, and % C_P
- (4) It is necessary to revise a computation when S content in oil exceeds 0.8%.

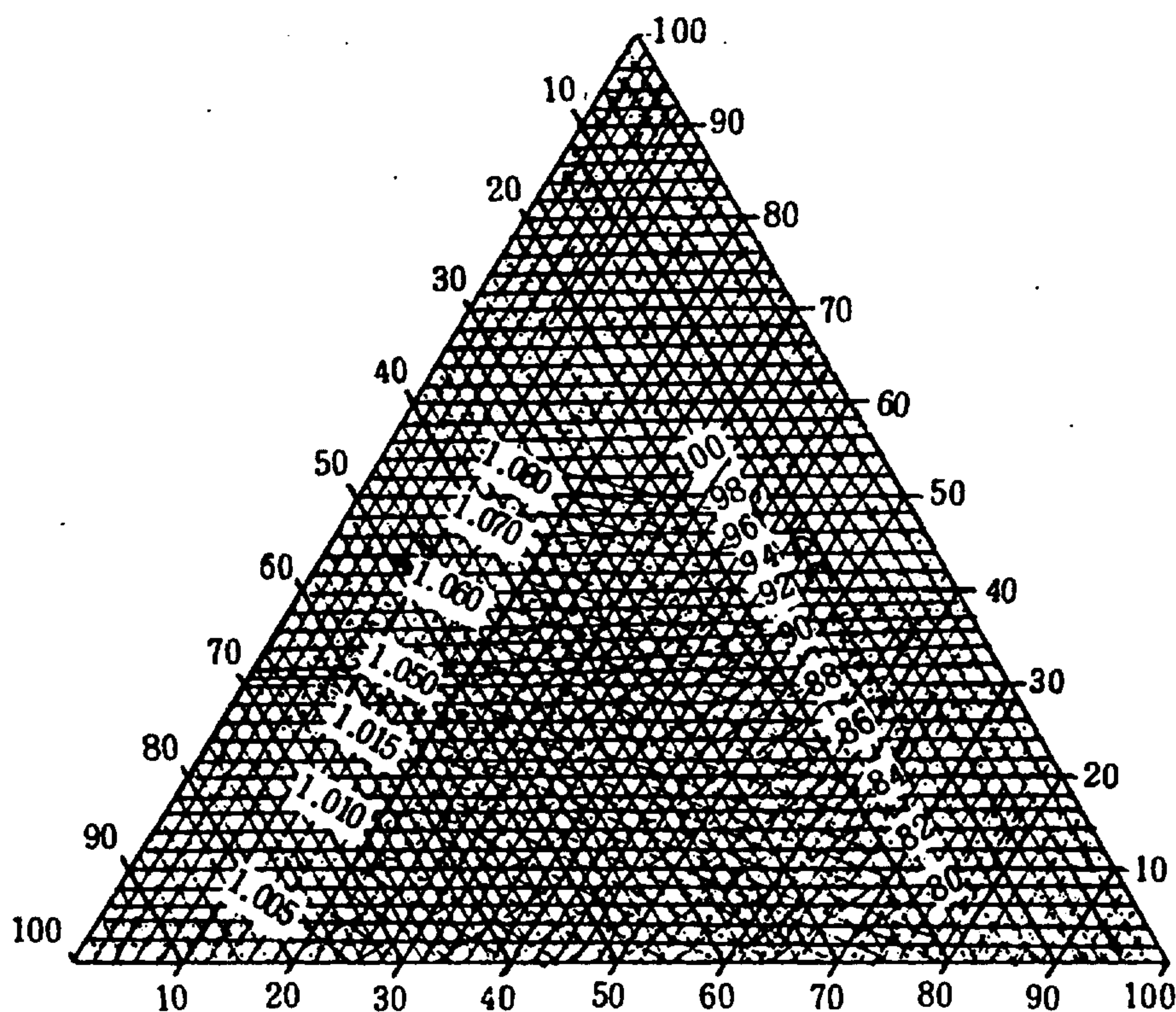


Fig. 2

% C_N reduces to wt% S / 0.288

% C_P adds to wt% S / 0.216