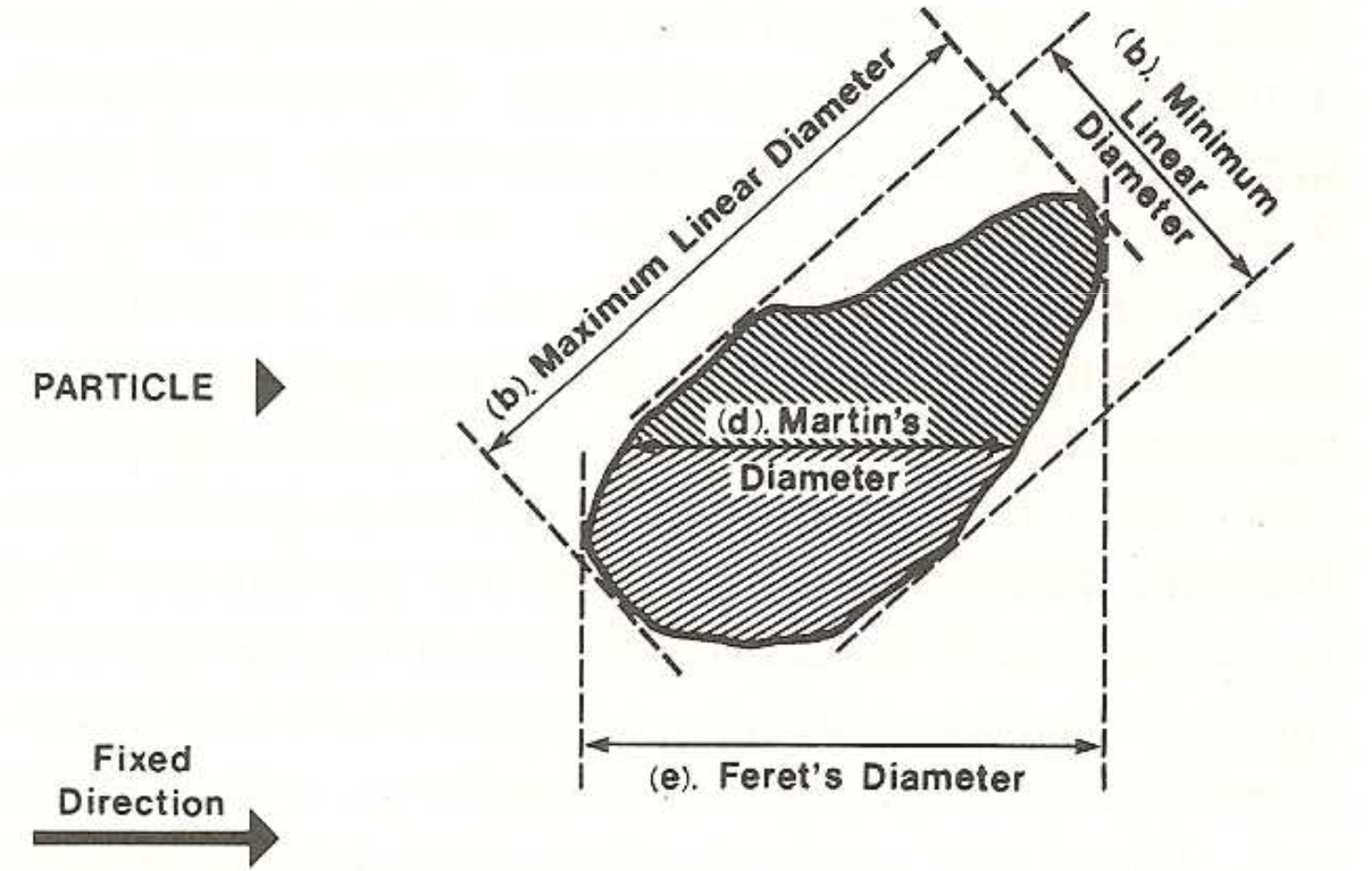
Particle Shape Analysis



Particle Shape Analysis

$$SSA = \frac{6}{\psi \rho d} \qquad \psi = \frac{d_s^2}{d_v^2}$$

Type of Material	Ψ
Rounded particles: water worn sands, fused flue-dust, atomised metals.	0.817
Angular particles of pulverised minerals: coal, limestone, sand.	0.655
Flaky particles: plumbago, talc, gypsum.	0.543
Very thin flakes: mica, graphite, aluminium.	0.216

$$\bar{d}_n = \frac{\sum m_i / d_i^2}{\sum m_i / d_i^3}$$

$$\bar{d}_s = \frac{\sum m_i / d_i}{\sum m_i / d_i^3}$$

$$\bar{d}_v = \frac{\sum m_i}{\sum m_i / d_i^3}$$

$$\bar{m}_n = \frac{\sum V_i / d_i^2}{\sum V_i / d_i^3} \qquad \bar{m}_s = \frac{\sum V_i}{\sum V_i / d_i}$$

$$\bar{m}_v = \frac{\sum V_i d_i}{\sum V_i}$$

Particle Shape Analysis

Some of these terms are given below:

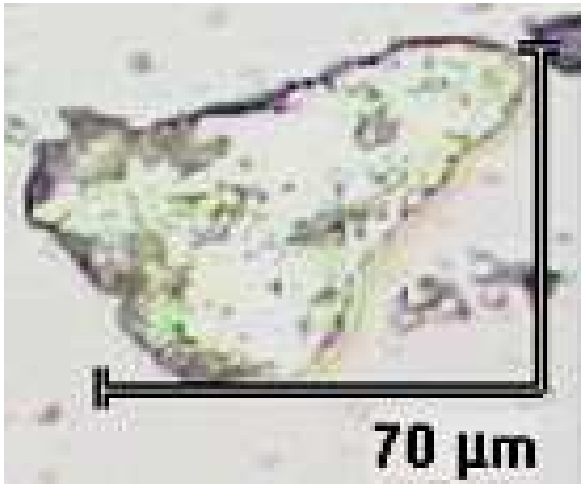
Acicular	needle-shaped
Angular	sharp-edged or having roughly polyhedral shape
Crystalline	freely developed in a fluid medium of geometric shape
Dendritic	having a branched crystalline shape
Fibrous	regular or irregularly thread-like
Flaky	plate-like
Granular	having approximately an equidimensional irregular shape
Irregular	lacking any symmetry
Modular	having rounded, irregular shape
Spherical	global shape

Table 4.1 Some methods of particle size analysis

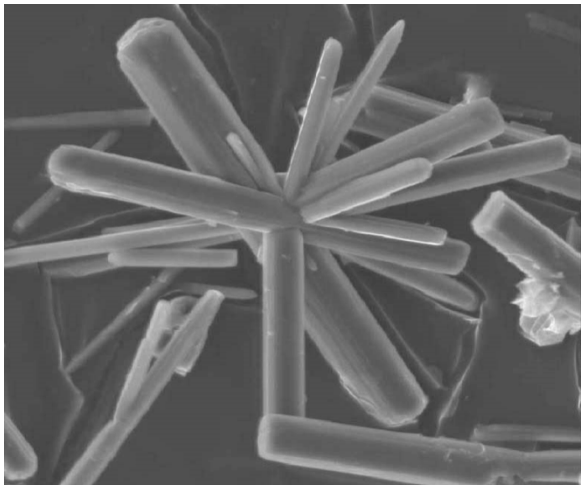
Method	*Wet or dry*	*Fractionated sample?*	*Approx. useful size range* (microns)*
Test sieving	Both	Yes	5–100,000
Laser diffraction	Both	No	0.1–2,000
Optical microscopy	Dry	No	0.2–50
Electron microscopy	Dry	No	0.005–100
Elutriation (cyclosizer)	Wet	Yes	5–45
Sedimentation (gravity)	Wet	Yes	1–40
Sedimentation (centrifuge)	Wet	Yes	0.05–5

* A micron (μm) is 10^{-6} m

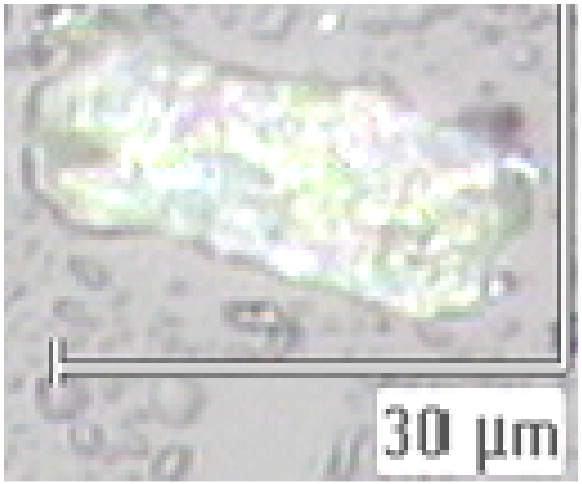
Particle Shape Analysis



Angular

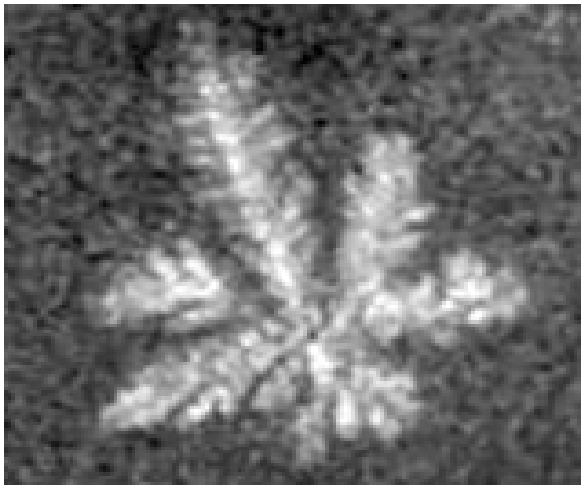


Fibrous

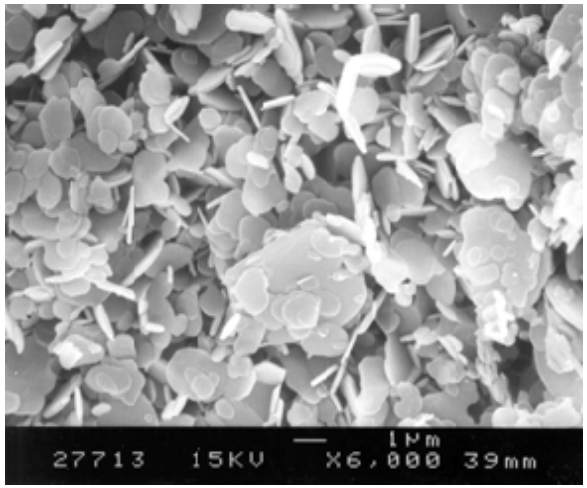


Granular

Acicular

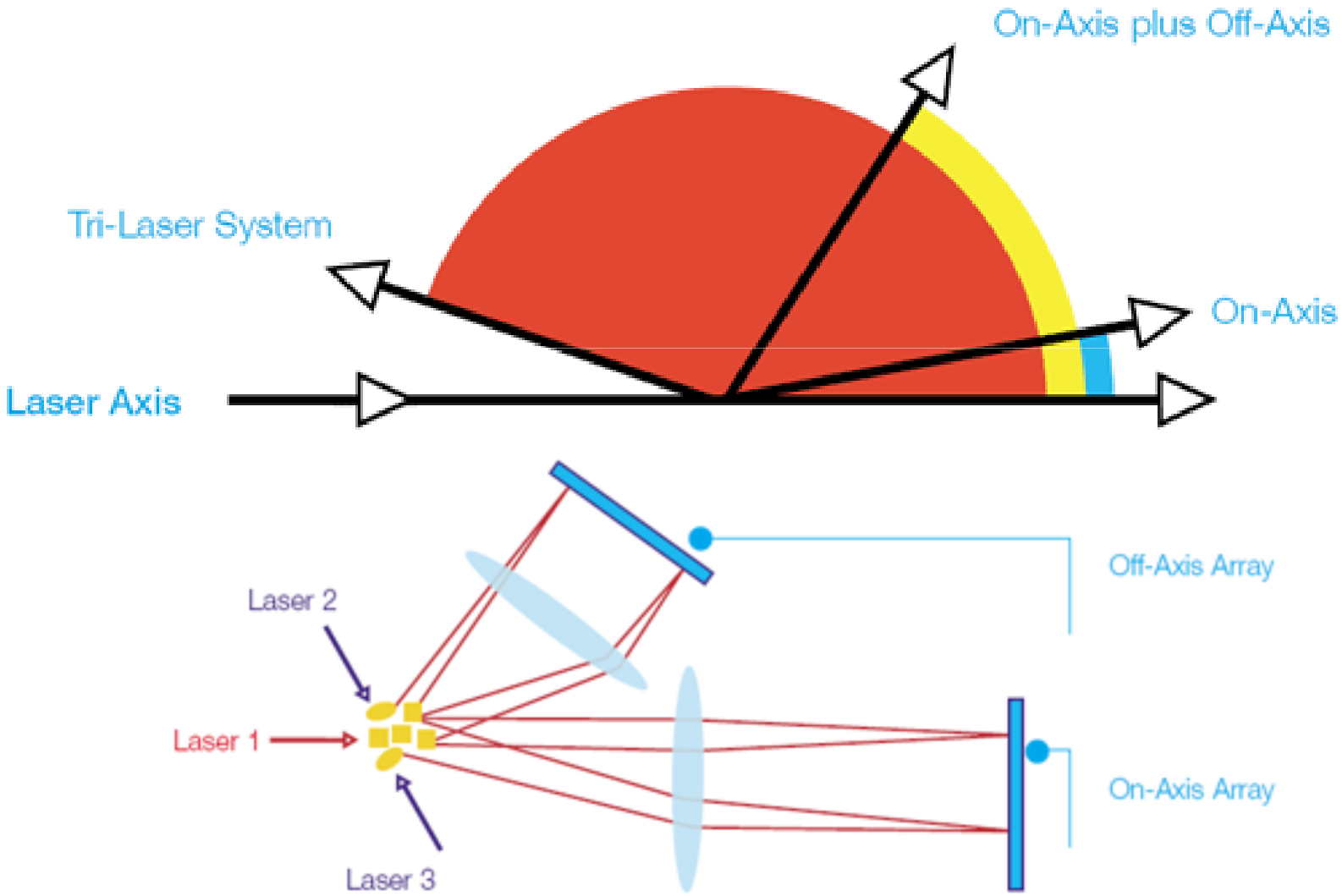


Dendritic



Flaky

Particle Size Analysis



Particle Size Analysis