Figures

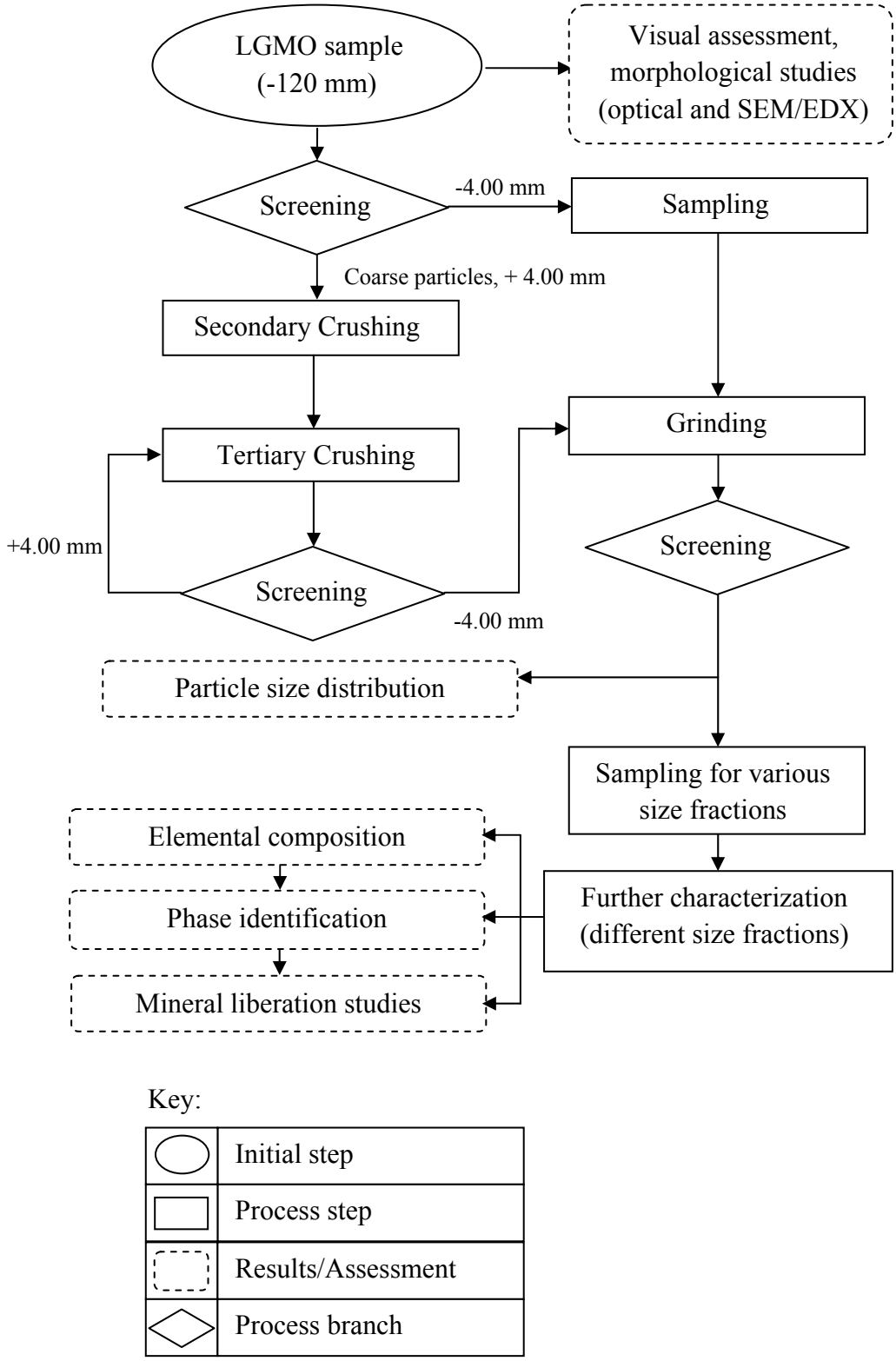

Figure 1: A flowchart depicting the stages involved in the characterization of LGMO in this work.

Figure 2: Visual assessment of Sungai Temau's LGMO, the sample for this work.

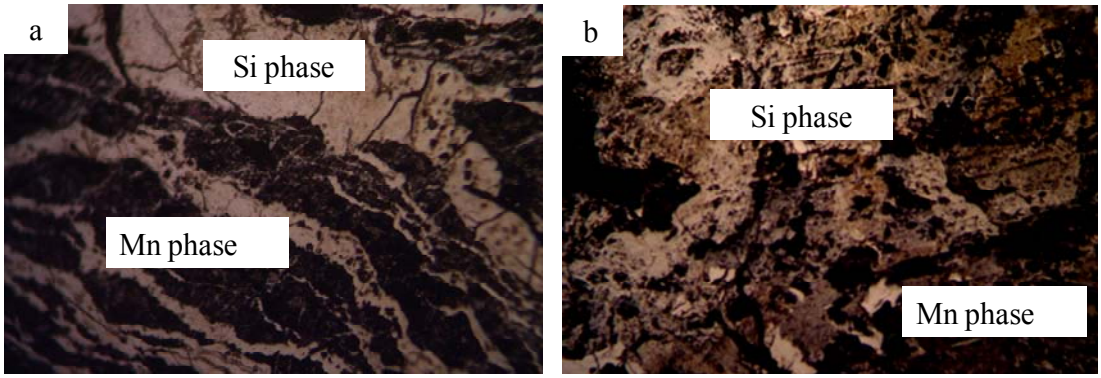

Figure 3: Optical microscope micrograph showing the complexity of mineralogy and texture of LGMO. Total magnification=3958X, (a) Zoning structure of Mn and Si phases, (b) Disseminated Mn phase in Si rich phase. Identification was done by EDX.

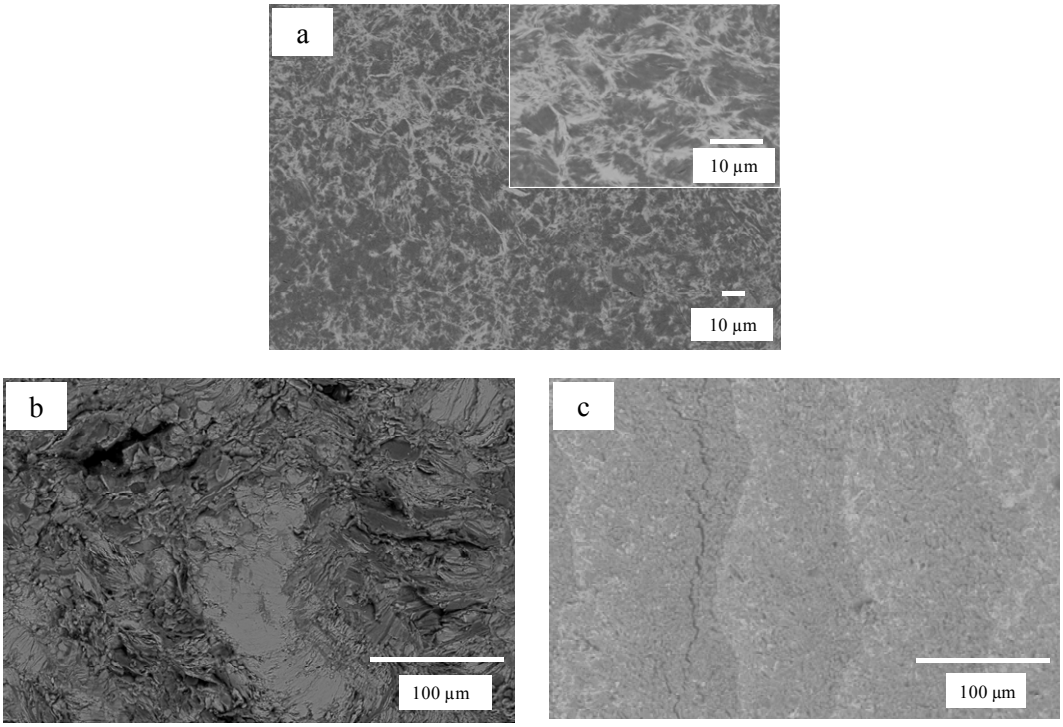

Figure 4: BSI photomicrograph of (a) Very fine manganese and aluminium-iron phase's intergrowth in quartz gangue, (b) fibrous manganese rich phase contained aluminium-iron phases, (c) zoning structure of different grey level of manganese and aluminium-iron phases.

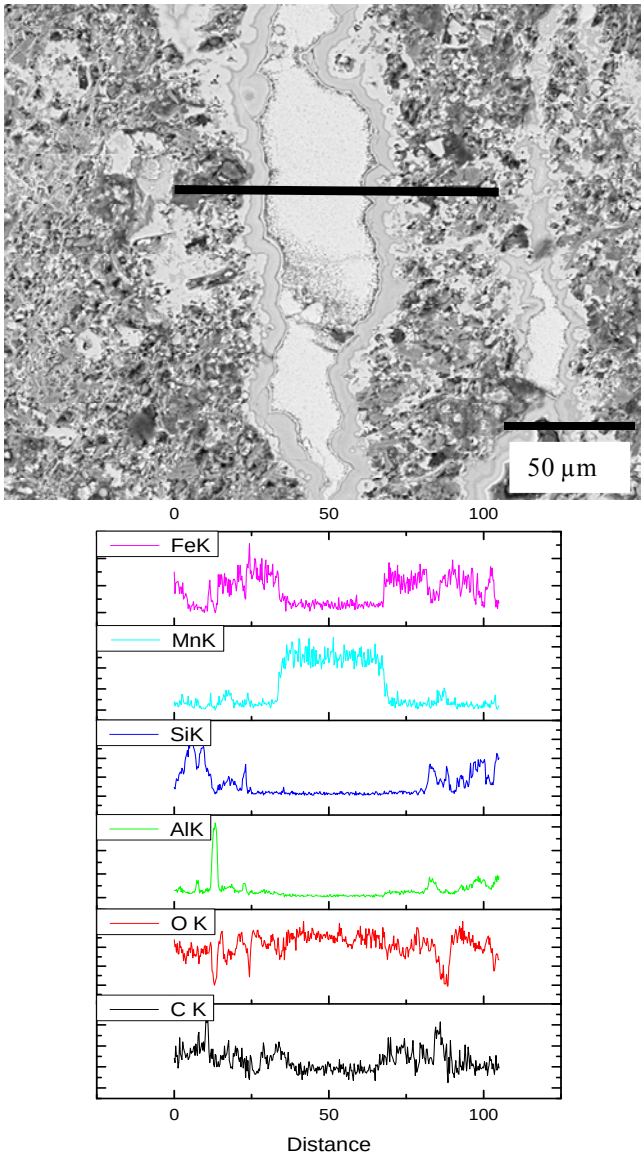

Figure 5: (Top) BSI photomicrograph of the Malaysian LGMO and (bottom) EDX linescan analysis showing compositional variation within the LGMO.

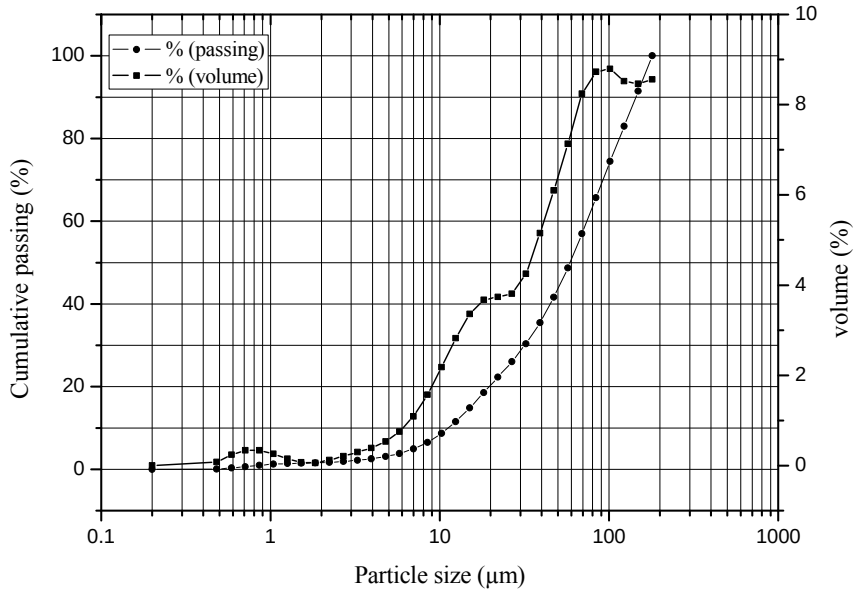

Figure 6: PSD of ground LGMO ≤75μm; cumulative and volume distribution curves.

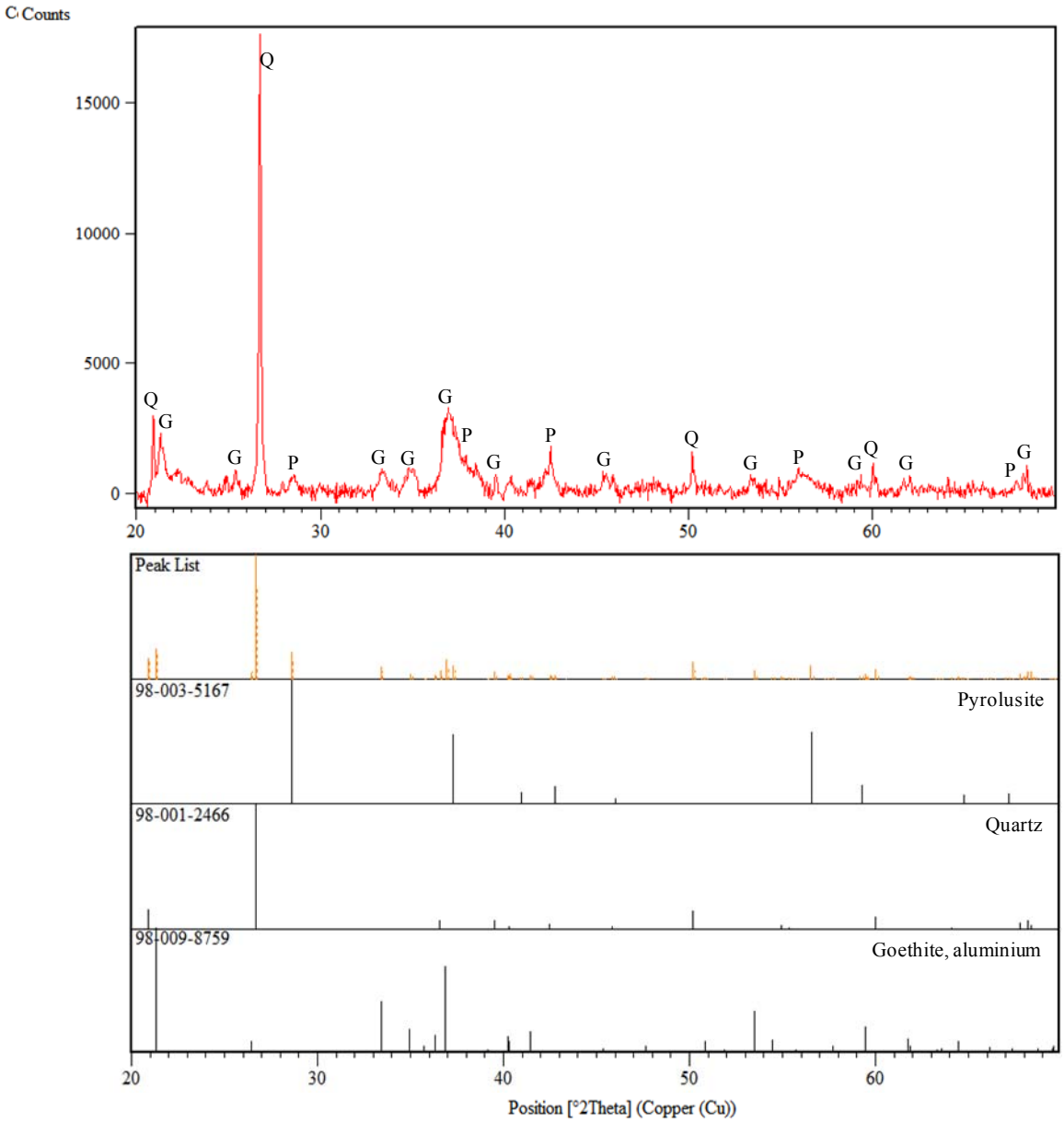

Figure 7: XRD pattern of LGMO samples. Abbreviations: Q, Quartz; P, Pyrolusite; G, Aluminium-substituted goethite.

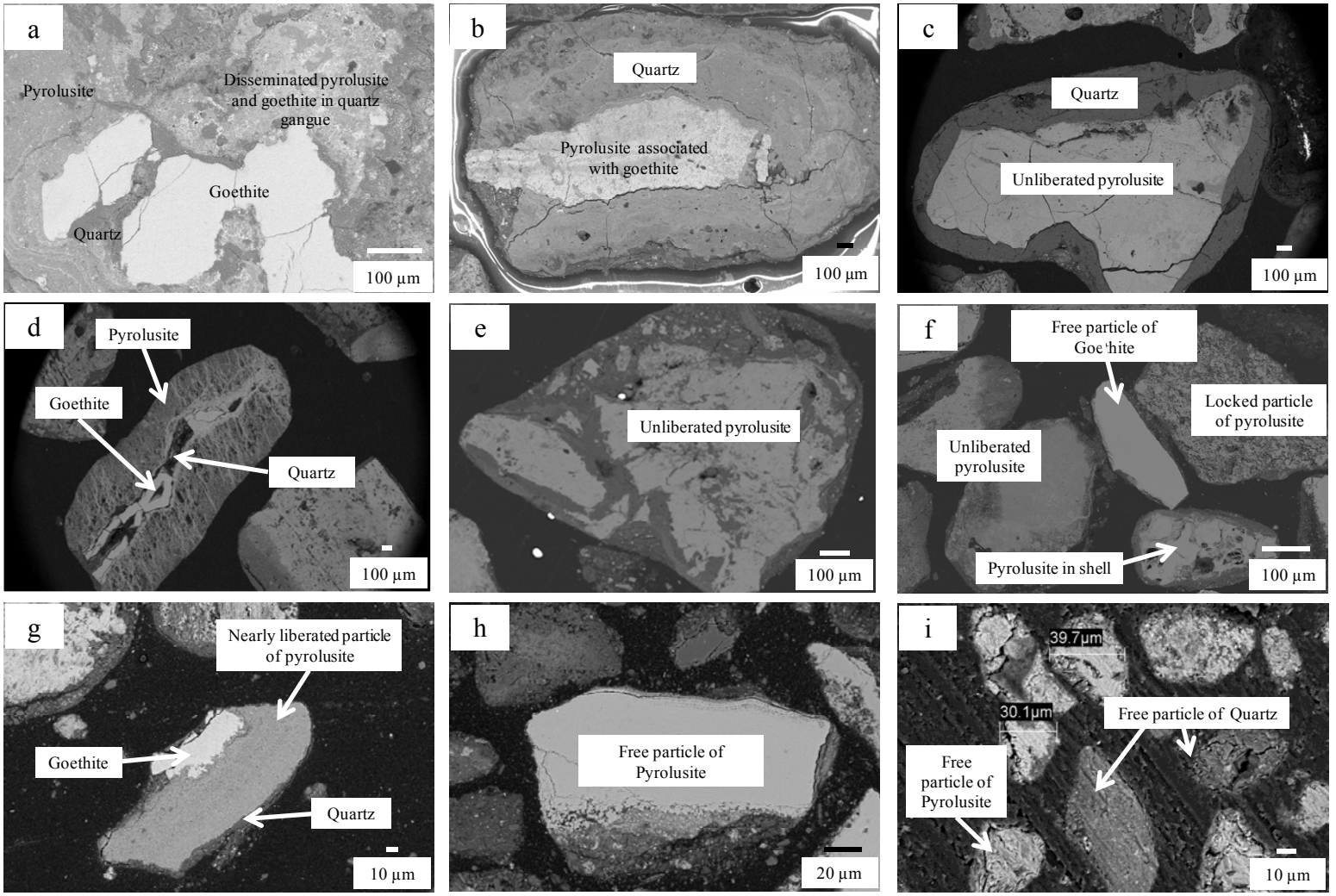

Figure 8: BSI of nine sample micrographs to distinguish the degree of mineral liberation at different LGMO size fractions. (a) Refers to (-4.00+3.35)mm, (b) (-3.35+2.8)mm, (c) (-2.80+1.18)mm, (d) (-1180+500)µm, (e) (-500+350)µm, (f) (-350+250)µm, (g) (-250+150)µm, (h) (-150+75)µm, and (i) -75µm.

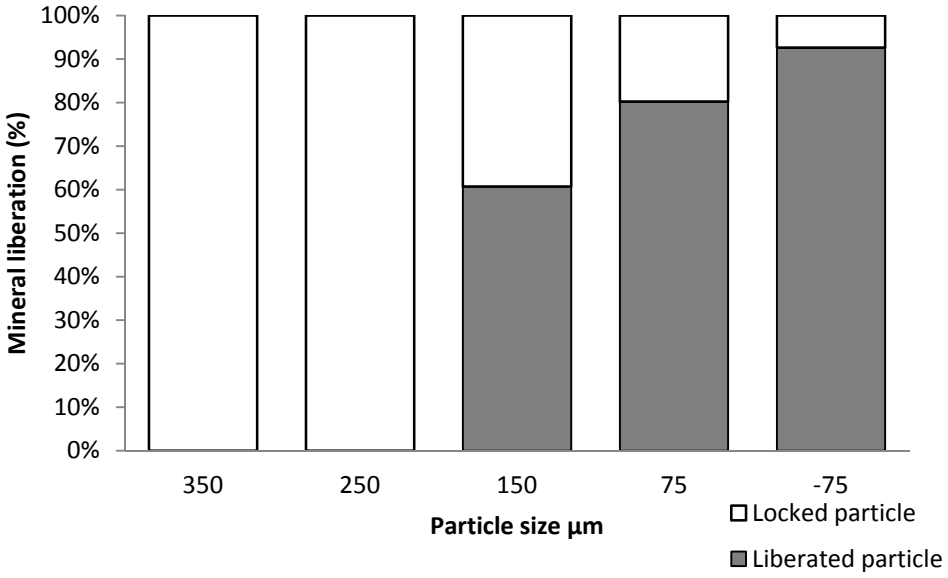

Figure 9: Percentage of liberation obtained from image analysis of particles as per Figure 6 (e-i), i.e., particle size fractions of (-350+250) µm, (-250+150) µm, (-150+75) µm, and -75 µm, respectively. Percentage of liberation was calculated as per equation (2) in section 2.6.