

S1 File. The GSAS classification formulas

$$\begin{aligned} \text{SqDist}[0] = & 655.4419 * A * A + 4.5344 * B * A + 342.1453 * B * B + 20.8175 * C * A + 288.9204 * C * B + \\ & 305.7983 * C * C + 11.4839 * D * A - 36.5454 * D * B - 101.8993 * D * C + 28.0598 * D * D + 0.0085 * E * A \\ & - 0.5685 * E * B + 1.5460 * E * C - 0.5787 * E * D + 0.01534 * E * E + 48.5341 * F * A + 13.8388 * F * B + 8.3 \\ & 993 * F * C - 1.2033 * F * D + 0.0050 * F * E + 15.1007 * F * F \end{aligned}$$

$$\begin{aligned} \text{SqDist}[FI] = & \text{SqDist}[0] + (-179.6581 * A) + (-174.4897 * B) + (-145.3251 * C) + 4.8872 * D + (-0.1094 \\ & * E) + (-26.0264 * F) + 46.9709 \end{aligned}$$

$$\begin{aligned} \text{SqDist}[GE] = & \text{SqDist}[0] + (-141.1148 * A) + (-154.7610 * B) + (-164.3586 * C) + 6.7265 * D + (-0.118 \\ & 1 * E) + (-20.3744 * F) + 41.0876 \end{aligned}$$

$$\begin{aligned} \text{SqDist}[MY] = & \text{SqDist}[0] + (-100.7481 * A) + (-181.7966 * B) + (-140.6547 * C) + (-1.324 * D) + (-0 \\ & .3071 * E) + (-19.3334 * F) + 43.7991 \end{aligned}$$

$$\begin{aligned} \text{SqDist}[SS] = & \text{SqDist}[0] + (-110.1316 * A) + (-166.6384 * B) + (-120.1344 * C) + (-2.6073 * D) + 0.09 \\ & 58 * E + (-17.6196 * F) + 33.7867 \end{aligned}$$

$$\begin{aligned} \text{Prob}\{FI\} = & 1 / (1 + \text{Exp}(-0.5 * (\text{SqDist}[GE] - \text{SqDist}[FI]))) + \text{Exp}(-0.5 * (\text{SqDist}[MY] - \text{SqDist}[FI])) + \\ & \text{Exp}(-0.5 * (\text{SqDist}[SS] - \text{SqDist}[FI])) \end{aligned}$$

$$\begin{aligned} \text{Prob}\{GE\} = & 1 / (1 + \text{Exp}(-0.5 * (\text{SqDist}[FI] - \text{SqDist}[GE]))) + \text{Exp}(-0.5 * (\text{SqDist}[MY] - \text{SqDist}[GE])) \\ & + \text{Exp}(-0.5 * (\text{SqDist}[SS] - \text{SqDist}[GE])) \end{aligned}$$

$$\begin{aligned} \text{Prob}\{MY\} = & 1 / (1 + \text{Exp}(-0.5 * (\text{SqDist}[FI] - \text{SqDist}[MY]))) + \text{Exp}(-0.5 * (\text{SqDist}[GE] - \text{SqDist}[MY])) \\ & + \text{Exp}(-0.5 * (\text{SqDist}[SS] - \text{SqDist}[MY])) \end{aligned}$$

$$\begin{aligned} \text{Prob}\{SS\} = & 1 / (1 + \text{Exp}(-0.5 * (\text{SqDist}[FI] - \text{SqDist}[SS]))) + \text{Exp}(-0.5 * (\text{SqDist}[GE] - \text{SqDist}[SS])) + \\ & \text{Exp}(-0.5 * (\text{SqDist}[MY] - \text{SqDist}[SS])) \end{aligned}$$

$$\text{Prob}\{FI\} + \text{Prob}\{GE\} + \text{Prob}\{MY\} + \text{Prob}\{SS\} = 1$$

A, RIM_DISC_RATIO_SECTION_1

B, RIM_DISC_RATIO_SECTION_4

C, MEAN_CUP_DEPTH

D, HEIGHT_VARIATION_CONTOUR

E, DISC_TILT_ANGLE

F, RIM_DECENTERING (ABS)

SqDist, square distance; Prob, probability.