Supplementary material to

Control of the size and compositional distributions in a milling process by using a reverse breakage matrix approach

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Coefficient functions given in eq. (11) expressed by elements of matrices *B* and *Y* and contents of ash in input fractions are:

$$A_{12} = b_{12}b_{23} - b_{13}b_{22},\ A_1 = b_{13}Y_{22}P_2 - b_{12}Y_{23}P_3,$$

$$A_2 = b_{22}Y_{13}P_3 - b_{23}Y_{12}P_2,\ A_0 = P_2P_3(Y_{12}Y_{23} - Y_{13}Y_{22}),$$

$$C_{12} = b_{13}b_{21} - b_{11}b_{23},\ C_1 = b_{11}Y_{23}P_3 - b_{13}Y_{21}P_1,$$

$$C_2 = b_{23}Y_{11}P_1 - b_{21}Y_{13}P_3,\ C_0 = P_1P_3(Y_{13}Y_{21} - Y_{11}Y_{23}),$$

$$B_{12} = b_{11}(b_{22} - b_{23}) + b_{12}(b_{23} - b_{21}) + b_{13}(b_{21} - b_{22}),$$

$$B_1 = P_1Y_{21}(b_{12} - b_{13}) + P_2Y_{22}(b_{13} - b_{11}) + P_3Y_{23}(b_{11} - b_{12}),$$

$$B_2 = P_1Y_{11}(b_{23} - b_{22}) + P_2Y_{12}(b_{21} - b_{23}) + P_3Y_{13}(b_{22} - b_{21}),$$

$$B_0 = P_2P_3(Y_{12}Y_{23} - Y_{13}Y_{22}) + P_1P_3(Y_{13}Y_{21} - Y_{11}Y_{23}) + P_1P_2(Y_{11}Y_{22} - Y_{12}Y_{21}).$$

Coefficient functions given in eq. (15) expressed by elements of matrices *B* and *Y* and contents of ash in input fractions are:

$$A_{11} = \frac{b_{12} - b_{13}}{Y_{11}P_1(b_{12} - b_{13}) - Y_{12}P_2(b_{11} - b_{13}) + Y_{13}P_3(b_{11} - b_{12})},$$

$$A_1 = \frac{Y_{13}P_3 - Y_{12}P_2}{Y_{11}P_1(b_{12} - b_{13}) - Y_{12}P_2(b_{11} - b_{13}) + Y_{13}P_3(b_{11} - b_{12})},$$

$$A_0 = \frac{Y_{12}P_2b_{13} - Y_{13}P_3b_{12}}{Y_{11}P_1(b_{12} - b_{13}) - Y_{12}P_2(b_{11} - b_{13}) + Y_{13}P_3(b_{11} - b_{12})},$$

$$B_{11} = \frac{b_{13} - b_{11}}{Y_{11}P_1(b_{12} - b_{13}) - Y_{12}P_2(b_{11} - b_{13}) + Y_{13}P_3(b_{11} - b_{12})},$$

$$B_1 = \frac{Y_{11}P_1 - Y_{13}P_3}{Y_{11}P_1(b_{12} - b_{13}) - Y_{12}P_2(b_{11} - b_{13}) + Y_{13}P_3(b_{11} - b_{12})}$$

$$B_0 = \frac{Y_{13}P_3b_{11} - Y_{11}P_1b_{13}}{Y_{11}P_1(b_{12} - b_{13}) - Y_{12}P_2(b_{11} - b_{13}) + Y_{13}P_3(b_{11} - b_{12})}.$$

Coefficient functions given in eq. (20) expressed by elements of matrices *B* and *Y* and contents of ash in input and output fractions are:

$$A_1 = \frac{(b_{12} - b_{13})p_1 + Y_{13}P_3 - Y_{12}P_2}{Y_{11}P_1(b_{12} - b_{13}) + Y_{12}P_2(b_{13} - b_{11}) + Y_{13}P_3(b_{11} - b_{12})},$$

$$A_0 = \frac{Y_{12}P_2b_{13} - Y_{13}P_3b_{12}}{Y_{11}P_1(b_{12} - b_{13}) + Y_{12}P_2(b_{13} - b_{11}) + Y_{13}P_3(b_{11} - b_{12})},$$

$$B_1 = \frac{(b_{13} - b_{11})p_1 + Y_{11}P_1 - Y_{13}P_3}{(b_{12} - b_{13})p_1 + Y_{13}P_3 - Y_{12}P_2},$$

$$B_1 = \frac{Y_{13}P_3 - b_{13}p_1}{(b_{12} - b_{13})p_1 + Y_{13}P_3 - Y_{12}P_2}.$$