The Synthetic Scale-up Data Generated by the Austin model and Their Estimation by the Kotake–Kanda Model

*Title of Manuscript

On the Similarity of Austin Model and Kotake–Kanda Model and Implications for Tumbling Ball Mill Scale-up

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*Keywords

ball milling, breakage, population balances, Austin model, Kotake model, scale-up

*Data Description

The Excel spreadsheet contains the synthetic scale-up data generated by the Austin model and their estimation using the Kotake–Kanda (KK) model, which overall yields the information presented in Table 2 of the manuscript. In view of all scale-up (SU) cases in Table 2, the Austin model, via Eqn. (12) of the manuscript, was used to produce the synthetic scale-up data, i.e., the specific breakage rate S_i*, to which the S_i* generated by the KK model, via Eqn. (13) of the manuscript, were compared (SU1–SU4 in Table 2). In SU1–SU4, standard values of the scale-up correction exponents, i.e., $N_1 = 0.5$ and $N_2 = 0.2$, were used. In SU5–SU8, N_1 and N_2 were estimated by fitting Eqn. (13) to the synthetic scale-up data for each diameter ratio D/D_T separately. In SU9–SU12, they were fitted to the synthetic scale-up data for all D/D_T data together. These two separate types of fits are presented in the Excel spreadsheet, which contains two separate spreadsheets entitled "Separately fitted" and "Simultaneously fitted." For simplicity, S_i* was replaced by Si in the Excel spreadsheet. Columns A and B yield, respectively, the ball size d_B values and the particle size x_i values from which the artificial S_i values were calculated using the Austin model for different values of D/D_T. A summary table is included at the far right side of the Excel spreadsheet, which presents the values used in Table 2 of the manuscript.

Nomenclature

Si,A and Si,K: S_i* calculated by the Austin model and estimated by the KK model
Si,Kmod: S_i* estimated by the KK model with modified (fitted) N_1 and N_2
Sqrt(Si,A) and Sqrt(Si,K): Square root of Si,A and Si,K
Sqrt(Si,Kmod): Square root of Si,Kmod
SE original: square error between the Austin and the KK model for $N_1 = 0.5$ and $N_2 = 0.2$
SE modified: square error between the Austin and the KK model for fitted N_1 and N_2

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