Supplementary material to "Constitutive Modeling of Hot Deformation of Carbon Steels in the Intercritical Zone"

Appendix. List of Symbols

ρ	Density of dislocations
ε	Strain rate
Ω	Coefficient of softening or dynamic restoration
U	Coefficient of hardening
σ	True stress
α	Constant (α is the reciprocal stress at which the material changes from power to exponential stress dependence in MPa^{-1})
μ	Shear module (it is the shear modulus at a temperature of 300 K) 4.21 X 10^4 zone α and 4.93 X 10^4 zone γ)
b	Burgers vector (2.58×10^{-10} m)
B, k	Constants associated to the nucleation mechanisms and growth velocity
X	Recrystallized volumetric fraction
ε_C	Peak strain (s^{-1})
d_o	Initial grain size
Z	Parameter of Zener Hollomon (the Zener–Hollomon parameter, which is particularly beneficial in describing hot working, since it embraces the two control variables)
K	Constant of the material
σ_p	Peak stress
σ_{ss}	steady stress level
$D(T)$	Self-diffusion coefficient
$E(T)$	Young's modulus
A	Material constant (structure factor (s^{-1}))
$\dot{\varepsilon}$	Strain rate
K_Ω, K_U	Constants of the materials
$T_{50\%}$	Time to reach 50% recrystallization
K_t	Constant material
Q	Activation energy (kJ/mol)

R	Gas constant (8.314 J mol^{-1} K^{-1})
T	Temperature (K)
n	Exponential factor
$sinh$	hyperbolic sine function
$E(T)_I$	Young's module in intercritical zone (α+γ)
$E(T)_\alpha$	Young's module in zone α
$E(T)_\gamma$	Young's module in zone γ
$\%X_\alpha$	Percent Fraction α.
$\%X_\gamma$	Percent Fraction γ
B_I	Intercritical zone constant
B_α	α zone constant (B is a structural parameter in m^{-2} α zone)
B_γ	γ zone constant
β_I	Intercritical zone constant
β_α	α zone constant (It is the dimensionless inverse stress that indicates the change from a power law to an exponential relationship between σ and ε)
β_γ	γ zone constant
Ω_I	Coefficient of softening in intercritical α zone
Ω_α	Coefficient of softening in α zone
Ω_γ	Coefficient of softening in γ zone
U_I	Coefficient of hardening in intercritical α zone
U_α	Coefficient of hardening in α zone
U_γ	Coefficient of hardening in γ zone
σ_I	Stress in intercritical zone
σ_α	Stress in α zone
σ_γ	Stress in γ zone
σ_{PE}	Experimental peak stress
σ_{PT}	Theoretical or modeled peak stress
ε_{PE}	Experimental peak strain
ε_{PT}	Theoretical or modeled peak strain
M	Taylor factor