

REFERENCES

- [1] P. Basu, Biomass gasification, pyrolysis and torrefaction, 2013.
- [2] L.M. Kamp, Learning in wind turbine development, 2002.
- [3] P. McKendry, Energy production from biomass (part 1): overview of biomass, *Bioresour. Technol.* 83 (2002) 37–46. doi:10.1016/S0960-8524(01)00119-5.
- [4] P. McKendry, Energy production from biomass (part 2): Conversion technologies, *Bioresour. Technol.* 83 (2002) 47–54. doi:10.1016/S0960-8524(01)00119-5.
- [5] J. Porteiro, J.L. Míguez, E. Granada, J.C. Moran, Mathematical modelling of the combustion of a single wood particle, *Fuel Process. Technol.* 87 (2006) 169–175. doi:10.1016/j.fuproc.2005.08.012.
- [6] T. Jurena, Numerical modelling of grate combustion, 2012.
- [7] J. Collazo, J. Porteiro, D. Patiño, E. Granada, Numerical modeling of the combustion of densified wood under fixed-bed conditions, *Fuel*. 93 (2012) 149–159. doi:10.1016/j.fuel.2011.09.044.
- [8] Y.B. Yang, V.N. Sharifi, J. Swithenbank, Numerical simulation of the burning characteristics of thermally-thick biomass fuels in packed-beds, *Process Saf. Environ. Prot.* 83 (2005) 549–558. doi:10.1205/psep.04284.
- [9] T.N. Adams, A simple fuel bed model for predicting particulate emissions from a wood-waste boiler, *Combust. Flame*. 39 (1980) 225–239. doi:10.1016/0010-2180(80)90020-6.
- [10] M.A. Gómez, J. Porteiro, D. Patiño, J.L. Míguez, CFD modelling of thermal conversion and packed bed compaction in biomass combustion, *Fuel*. 117 (2013) 716–732. doi:10.1016/j.fuel.2013.08.078.
- [11] J. Porteiro, D. Patiño, J. Moran, E. Granada, Study of a fixed-bed biomass combustor: Influential parameters on ignition front propagation using parametric analysis, *Energy and Fuels*. 24 (2010) 3890–3897.

doi:10.1021/ef100422y.

- [12] U. Kumar, A.M. Salem, M.C. Paul, Investigating the thermochemical conversion of biomass in a downdraft gasifier with a volatile break-up approach, *Energy Procedia*. 142 (2017) 822–828.
doi:10.1016/j.egypro.2017.12.132.
- [13] Q. Xiong, S.C. Kong, High-Resolution Particle-Scale Simulation of Biomass Pyrolysis, *ACS Sustain. Chem. Eng.* 4 (2016) 5456–5461.
doi:10.1021/acssuschemeng.6b01020.
- [14] M.G. Gronli, *A theoretical and experimental study of the thermal degradation of biomass*, 1996.
- [15] A. Lavergne, *Evaluation of tree-ring archive as paleoclimatic tracer in northern Patagonia*, Universite Paris-Saclay, 2016.
- [16] N. Duffy, *Investigation of Biomass Combustion in Grate Furnaces using CFD*, 2012.
- [17] R. Cocco, S.B. Reddy Karry, T. Knowlton, *Introduction to Fluidization*, (2014) 21–29. www.aiche.org/cep.
- [18] N. Fernando, M. Narayana, W.A.M.K.P. Wickramaarachchi, The effects of air velocity, temperature and particle size on low-temperature bed drying of wood chips, *Biomass Convers. Biorefinery*. (2017) 1–30. doi:10.1007/s13399-017-0257-7.
- [19] T. Jurena, *Brno University of Technology Numerical Modelling of Grate Combustion*, *Vutium.Vutbr.Cz.* (2012) 1–109.
<http://www.vutium.vutbr.cz/tituly/pdf/ukazka/978-80-214-4649-6.pdf>.
- [20] F.P. Incropera, D.P. DeWitt, T.L. Bergman, A.S. Lavine, *Fundamentals of Heat and Mass Transfer*, 2007. doi:10.1073/pnas.0703993104.
- [21] J. Porteiro, J.L. Míguez, E. Granada, J.C. Moran, Mathematical modelling of the combustion of a single wood particle, *Fuel Process. Technol.* 87 (2006) 169–175. doi:10.1016/J.FUPROC.2005.08.012.

- [22] C. Bruch, B. Peters, T. Nussbaumer, Modeling Wood Combustion Under Fixed Bed Conditions, *Fuel*. 82 (2003) 729–738.
doi:[http://dx.doi.org/10.1016/S0016-2361\(02\)00296-X](http://dx.doi.org/10.1016/S0016-2361(02)00296-X).
- [23] R. Mehrabian, S. Zahirovic, R. Scharler, I. Obernberger, S. Kleditzsch, S. Wirtz, V. Scherer, H. Lu, L.L. Baxter, A CFD model for thermal conversion of thermally thick biomass particles, *Fuel Process. Technol.* 95 (2012) 96–108. doi:[10.1016/j.fuproc.2011.11.021](https://doi.org/10.1016/j.fuproc.2011.11.021).
- [24] M. Bellais, Modelling of the pyrolysis of large wood particles, 2007.
doi:[10.1016/j.biortech.2009.01.007](https://doi.org/10.1016/j.biortech.2009.01.007).
- [25] W.-C.R. Chan, Kelbon Marica, B.B. Krieger, Modeling and Experimental Verification of Physical and Chemical Process during Pyrolysis of a Large Biomass Particle, *Fuel*. 64 (1985) 1505–1513.
- [26] Q. Zhang, Mathematical Modeling of Municipal Solid Waste Plasma Gasification in a Fixedbed Melting Reactor, KTH, 2011.
- [27] A. Galgano, C. Di Blasi, A. Galgano, C. Di Blasi, Modeling Wood Degradation by the Unreacted-Core-Shrinking Approximation, 42 (2003) 2101–2111. doi:[10.1021/ie020939o](https://doi.org/10.1021/ie020939o).
- [28] Y.B. Yang, V.N. Sharifi, J. Swithenbank, L. Ma, L. I, J.M. Jones, M. Pourkashanian, A. Williams, L.I. Darvell, Combustion of a Single Particle of Biomass, *Energy & Fuels*. (2008) 306–316. doi:[10.1021/ef700305r](https://doi.org/10.1021/ef700305r).
- [29] H. Kobayashi, J.B. Howard, A.F. Sarofim, Coal devolatilization at high temperatures, *Symp. Combust.* 16 (1977) 411–425. doi:[10.1016/S0082-0784\(77\)80341-X](https://doi.org/10.1016/S0082-0784(77)80341-X).
- [30] P.P.S.C. FRED SHAFIZADEH, Thermal Deterioration of Wood, in: 1977: pp. 57–81.
- [31] U. Sand, J. Sandberg, J. Larfeldt, R. Bel Fdhila, Numerical prediction of the transport and pyrolysis in the interior and surrounding of dry and wet wood log, *Appl. Energy*. 85 (2008) 1208–1224.
doi:[10.1016/j.apenergy.2008.03.001](https://doi.org/10.1016/j.apenergy.2008.03.001).

- [32] N. Scotia, D. V Ellis, Effects of W o o d Waste on Sand-Bed Benthos, Measurement. 115 (1978) 543–559.
- [33] M. Bellais, Modelling of the Pyrolysis of Large Wood Particles, KTH, 2007.
- [34] Y. Haseli, Modeling combustion of single biomass particle, 2012. doi:10.6100/IR735438.
- [35] N.M. Laurendeal, Heterogeneous kinetics of coal char gasification and combustion, 4 (1978) 221–2.
- [36] J.C. Wurzenberger, S. Wallner, H. Raupenstrauch, A.- Graz, J.G. Khinast, Thermal Conversion of Biomass : Comprehensive Reactor and Particle Modeling, 48 (2002).
- [37] Y. Bin Yang, C. Ryu, A. Khor, V.N. Sharifi, J. Swithenbank, Fuel size effect on pinewood combustion in a packed bed, Fuel. 84 (2005) 2026–2038. doi:10.1016/j.fuel.2005.04.022.
- [38] A. Lavoisier, Homogeneous and heterogeneous combustion, Encycl. Hydrocarb. V (2005) 413–430. http://www.treccani.it/export/sites/default/Portale/sito/altre_aree/Tecnologia_e_Scienze_applicate/enciclopedia/inglese/inglese_vol_5/413_430_ing.pdf.
- [39] CHEMKIN-CFD | Reaction Design, (n.d.). <http://www.reactiondesign.com/products/chemkin-cfd/> (accessed November 15, 2018).
- [40] Cantera, (n.d.). <https://cantera.org/> (accessed February 24, 2019).
- [41] Chemical Workbench – integrated software tool for kinetic mechanism development, reactor modeling and conceptual design, (n.d.). <http://www.kintechlab.com/products/chemical-workbench/> (accessed August 24, 2018).
- [42] R. Chan, B.B. Krieger, Modeling of Physical and Chemical Processes During Pyrolysis of a Large Biomass Pellet With Experimental Verification., ACS Div. Fuel Chem. Prepr. 28 (1983) 330–337.

- [43] H. Thunman, B. Leckner, F. Niklasson, F. Johnsson, Combustion of wood particles - A particle model for Eulerian calculations, *Combust. Flame*. 129 (2002) 30–46. doi:10.1016/S0010-2180(01)00371-6.
- [44] J. Porteiro, E. Granada, J. Collazo, D. Patiño, J.C. Morán, A model for the combustion of large particles of densified wood, *Energy and Fuels*. 21 (2007) 3151–3159. doi:10.1021/ef0701891.
- [45] K. Kwiatkowskia, P.J. Zuk, K. Bajer, M. Dudynski, Biomass gasification solver based on OpenFOAM, (2013) 1–29.
http://syngasburner.eu/~ventures/sites/default/files/foam_rev1.pdf.
- [46] A. Burton, Wu.H, Quantification of Interactions between Sand and Pyrolyzing Biomass Particles in Fluidized bed under Fast Pyrolysis Conditions Pertinent to Bio-oil Production, 54 (2015) 7990–7997.
- [47] Y. Bin Yang, C. Ryu, A. Khor, N.E. Yates, V.N. Sharifi, J. Swithenbank, Effect of fuel properties on biomass combustion. Part II. Modelling approach - Identification of the controlling factors, *Fuel*. 84 (2005) 2116–2130. doi:10.1016/j.fuel.2005.04.023.
- [48] C. Mandl, I. Obernberger, F. Biedermann, Modelling of an updraft fixed-bed gasifier operated with softwood pellets, *Fuel*. 89 (2010) 3795–3806. doi:10.1016/j.fuel.2010.07.014.
- [49] N. Fernando, M. Narayana, A comprehensive two dimensional Computational Fluid Dynamics model for an updraft biomass gasifier, *Renew. Energy*. 99 (2016) 698–710. doi:10.1016/j.renene.2016.07.057.
- [50] K.U.C. Perera, M. Narayana, Finite volume analysis of biomass particle pyrolysis, in: *MERCon*, 2017.
- [51] P. Mckendry, Energy production from biomass (part 1): overview of biomass, *Bioresour. Technol*. 83 (2002) 37–46.
- [52] H. Yang, R. Yan, H. Chen, D.H. Lee, C. Zheng, Characteristics of hemicellulose, cellulose and lignin pyrolysis, *Fuel*. 86 (2007) 1781–1788. doi:10.1016/j.fuel.2006.12.013.

- [53] C. Branca, A. Albano, C. Di Blasi, Critical evaluation of global mechanisms of wood devolatilization, *Thermochim. Acta.* 429 (2005) 133–141. doi:10.1016/j.tca.2005.02.030.
- [54] H. Thunman, F. Niklasson, F. Johnsson, B. Leckner, Properties of Wood for Modeling of Fixed or Fluidized, *Energy & Fuels.* (2001) 1488–1497. doi:10.1021/ef010097q.
- [55] H. Lu, W. Robert, G. Peirce, B. Ripa, L.L. Baxter, Comprehensive study of biomass particle combustion, *Energy and Fuels.* 22 (2008) 2826–2839. doi:10.1021/ef800006z.
- [56] R.F. Baddour, J.M. Iwasyk, Reactions Between Elemental Carbon and Hydrogen at T Temperatures, *I&EC Process Des. Dev.* 1 (1962) 169–176.
- [57] Y. Haseli, J.A. van Oijen, L.P.H. de Goeij, A detailed one-dimensional model of combustion of a woody biomass particle, *Bioresour. Technol.* 102 (2011) 9772–9782. doi:10.1016/j.biortech.2011.07.075.
- [58] R.E. Treybal, *Mass-Transfer Operations*, *Chem. Eng. Sci.* 5 (1956). doi:10.1016/0009-2509(56)80037-7.
- [59] R.B. Bird, W.E. Stewart, E.N. Lightfoot, *Transport Phenomena*, 2nd ed., 2002. doi:10.1002/aic.690070245.
- [60] D. Bergström, S. Israelsson, M. Öhman, S.A. Dahlqvist, R. Gref, C. Boman, I. Wästerlund, Effects of raw material particle size distribution on the characteristics of Scots pine sawdust fuel pellets, *Fuel Process. Technol.* 89 (2008) 1324–1329. doi:10.1016/j.fuproc.2008.06.001.
- [61] M. Sreekanth, D.R. Sudhakar, B.V.S.S.S. Prasad, A.K. Kolar, B. Leckner, Modelling and experimental investigation of devolatilizing wood in a fluidized bed combustor, *Fuel.* 87 (2008) 2698–2712. doi:10.1016/j.fuel.2008.02.005.
- [62] ANSYS Inc., *ANSYS Fluent User's Guide*, 15317 (2013) 724–746.
- [63] G. Krishnamoorthy, A computationally efficient P1 radiation model for modern combustion systems utilizing pre-conditioned conjugate gradient methods, *Appl. Therm. Eng.* 119 (2017) 197–206.

doi:10.1016/j.applthermaleng.2017.03.055.

- [64] I. Wardach-Swiecicka, D. Karda, Modeling of heat and mass transfer during thermal decomposition of a single solid fuel particle, 34 (2013) 53–71. doi:10.2478/aoter-2013-0010.
- [65] H. Lu, Experimental and Modeling Investigations of Biomass Particle Combustion, 2006. doi:10.1007/s11739-017-1632-x.
- [66] D. Li, Impact of torrefaction on grindability, hydrophobicity and fuel characteristics of biomass relevant to Hawai‘i, (2015).
- [67] P.C. a Bergman, a R. Boersma, R.W.R. Zwart, J.H. a Kiel, Torrefaction for biomass co-firing in existing coal-fired power stations, Energy Res. Cent. Netherlands ECN ECNC05013. (2005) 71. doi:ECN-C--05-013.
- [68] J. Li, Volumetric combustion of torrefied biomass for large percentage biomass co-firing up to 100% fuel switch, KTH Royal Institute of Technology, 2014.
- [69] M.J.C. Van Der Stelt, Chemistry and reaction kinetics of biowaste torrefaction, 2010. doi:978-90-386-2435-8.
- [70] Solid biofuels – Determination of moisture content – Oven dry method – Part 2: Total moisture – Simplified method; German version, (2015) 11.