

Main reactions during biomass gasification

Primary devolatilization				
		Primary tar (CH _x O _y)		
Biomass	→	CO, CO ₂ , CH ₄ , C ₂ H ₄ , H ₂ O		[eq.1]
		Carbon		
Tar cracking and reforming				
		Secondary tar		
Primary tar	→	CO, CO ₂ , CH ₄ , C ₂ H ₄ , H ₂		[eq.2]
Homogenous gas-phase-reactions			ΔH	
Secondary tars	→	C, CO, H ₂		[eq.3]
H ₂ + 0,5 O ₂	→	H ₂ O	-242 kJ/mol	[eq.4]
CO + 0,5 O ₂	→	CO ₂	-283 kJ/mol	[eq.5]
CH ₄ + 0,5 O ₂	→	CO + 2 H ₂	-110 kJ/mol	[eq.6]
CH ₄ + CO ₂	→	2 CO + 2 H ₂	+247 kJ/mol	[eq.7]
CH ₄ + H ₂ O	→	CO + 3 H ₂	+206 kJ/mol	[eq.8]
CO + H ₂ O	→	CO ₂ + H ₂	-40,9 kJ/mol	[eq.9]
Heterogenous reactions				
C + O ₂	→	CO ₂	-393,5 kJ/mol	[eq.10]
C + 0,5 O ₂	→	CO	-123,1 kJ/mol	[eq.11]
C + CO ₂	→	2 CO	+159,9 kJ/mol	[eq.12]
C + H ₂ O	→	CO + H ₂	+118,5 kJ/mol	[eq.13]
C + 2 H ₂	→	CH ₄	-87,5 kJ/mol	[eq.14]
[eq.4]		H ₂ – Combustion (oxidation)		
[eq.5]		CO - Combustion (oxidation)		
[eq.6]		CH ₄ - Combustion (oxidation)		
[eq.7]		Dry reforming reaction		
[eq.8]		Steam reforming methanisation		
[eq.9]		Water-gas-shift reaction		
[eq.10]		Oxidation of carbon		
[eq.11]		Partial oxidation		
[eq.12]		Boudoard equilibrium		
[eq.13]		Water gas reaction (steam reforming)		
[eq.14]		Methane production reaction		