Oxy-combustion characteristics on the variation of oxygen concentration and biomass co-firing ratio using a 0.1 MWth circulating fluidized bed combustion test-rig

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Oxy-fuel combustion with a circulating fluidized bed (Oxy-CFBC) can make it easy to separate high purity CO2 during combustion and to reduce CO2 by fuel switching from coal to biomass as carbon neutral. This research aims to investigate Oxy-CFBC characteristics, temperature and solid hold-up related pressure in riser, flue gas concentrations including CO2 and emissions, SO2, NO and CO and combustion efficiency with increasing O2 concentration (21-29 vol.%) as a combustion agent and biomass co-firing ratios (50 wt.%, 70 wt.%, 100 wt.% with domestic wood pellet). Furthermore, the possibility of bio-energy carbon capture and storage (BECCS) for negative CO2 emission is also to evaluate using a 0.1 MWth Oxy-CFBC test-rig. As a result, it reveals that the transition from air-fired to oxy-fired and biomass co-firing were stably operated by separating the high CO2 concentration in flue gas. In addition, the CO2 negative emission was predicted about -600 g/kWth for oxy-fired with biomass in steady of lignite.