SUPPORTING INFORMATION

Optimizing Waste Valorization: Catalytic Co-Pyrolysis of Cabbage Waste and Tire Waste for Enhanced Bio-Oil and Syngas Production Utilizing Char as a Reforming Catalyst

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The formulas used to calculate the integral yield of the compound during TG-FTIR analysis are presented in Section 3.3.

$$CO_2\ (2327cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 2327cm^{-1}}$$

$$NO\ (1762cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 1762cm^{-1}}$$

$$SO_2\ (1342cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 1342cm^{-1}}$$

$$CO\ (2279cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 2279cm^{-1}}$$

$$CH_3COOH\ (1653cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 1653cm^{-1}}$$

$$H_2O\ (1450cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 1450cm^{-1}}$$

$$C_6H_5OH\ (1287cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 1287cm^{-1}}$$

$$HCOOH\ (1157cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 1157cm^{-1}}$$

$$CH_3CH_2OH\ (1063cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 1063cm^{-1}}$$

$$C{=}C\ (1537cm^{-1}) = \frac{\int_{50}^{800} 2327cm^{-1} + \int_{50}^{800} 1762cm^{-1} + \int_{50}^{800} 1342cm^{-1} + \int_{50}^{800} 2279cm^{-1} + \int_{50}^{800} 1653cm^{-1} + \int_{50}^{800} 1450cm^{-1} + \int_{50}^{800} 1287cm^{-1} + \int_{50}^{800} 1157cm^{-1} + \int_{50}^{800} 1063cm^{-1} + \int_{50}^{800} 1537cm^{-1}}{\int_{50}^{800} 1537cm^{-1}}$$

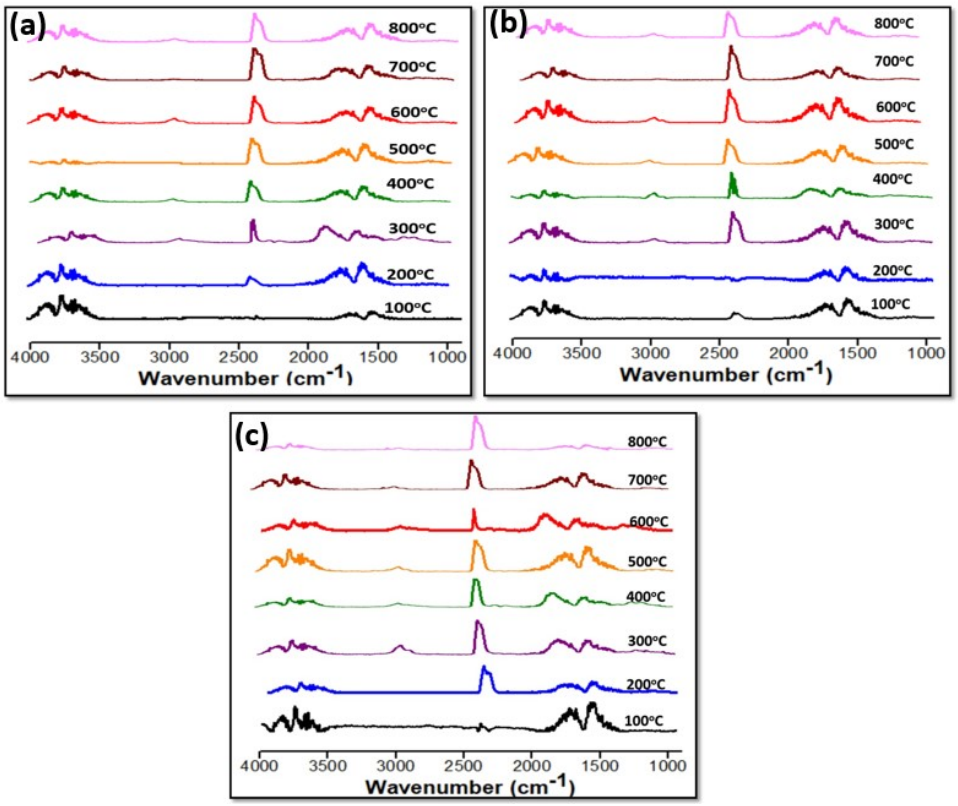

Fig. S1. FTIR spectra of volatiles released during **(a)** CW pyrolysis **(b)** co-pyrolysis and **(c)** catalytic co-pyrolysis

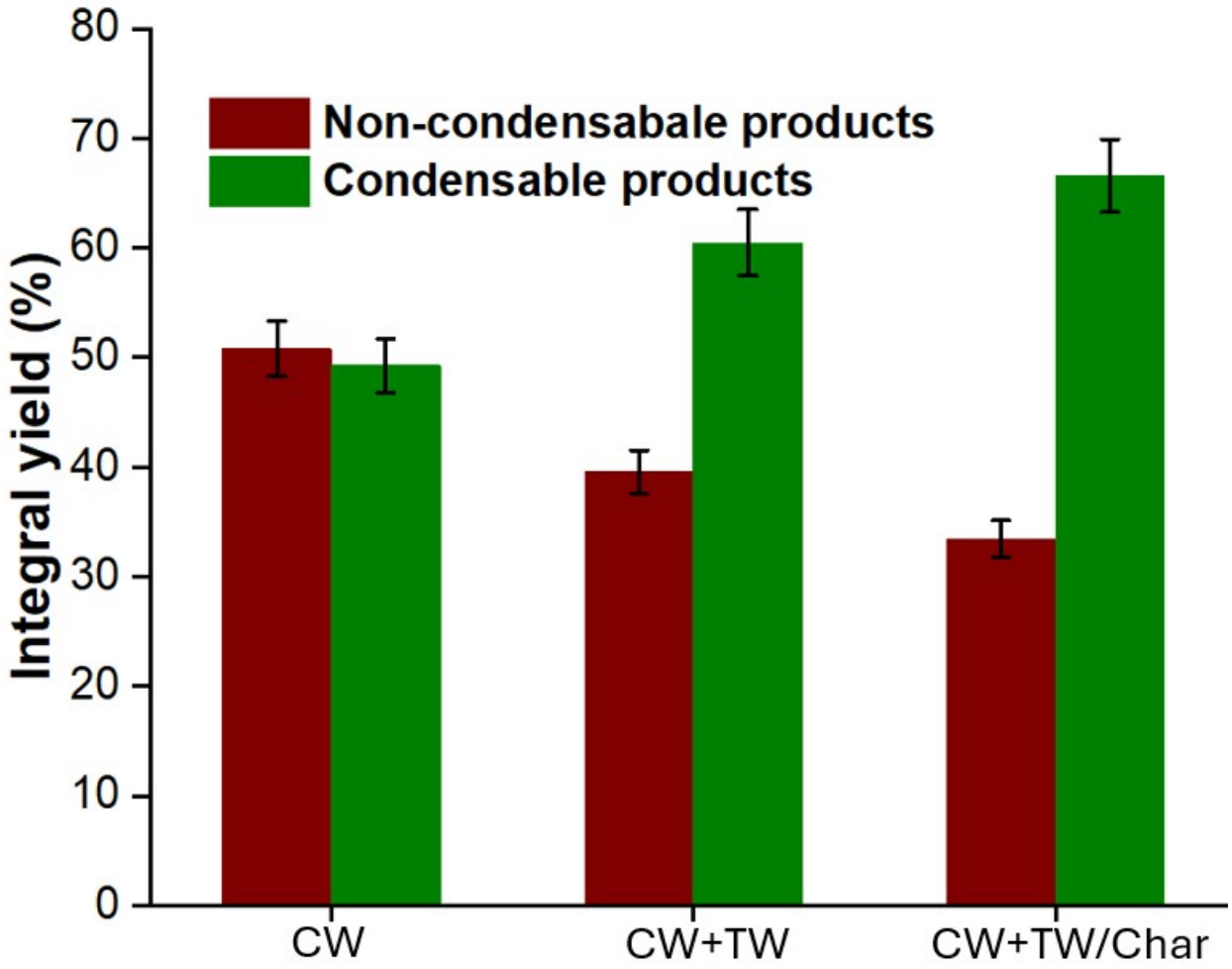

Fig. S2. Integral yield of condensable and non-condensable products of CW, co-pyrolysis with TW and catalytic pyrolysis with char at 500°C