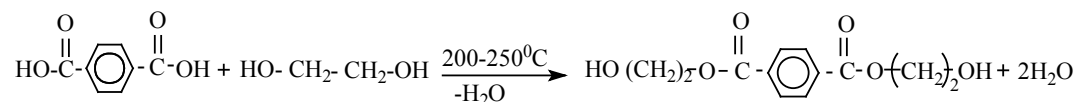# Supporting   material

1. NIR spectra of RC-IJP and PET membrane

The instrument of FT-NIR spectrometer is shown in Figure S1. NIR spectra of 45 samples are shown in Figure S2.
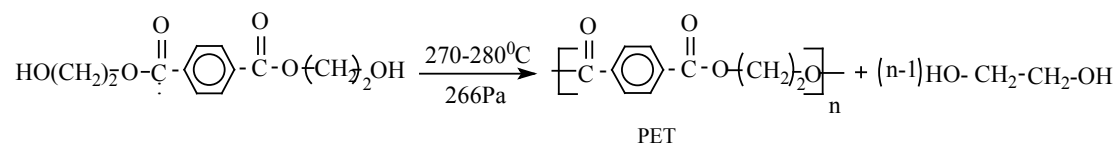
The absorption of NIR spectra was caused by the molecular overtone or molecular combination vibrations. Hydrogen-containing bands are observed characteristic for polymers in NIR spectra and analyzed the composition of polymer. Monemer preparation and polymerization of PET is shown below.

Monemer preparation :

$$HO\text{-}C\text{-}\langle\bigcirc\rangle\text{-}C\text{-}OH + HO\text{-}CH_2\text{-}CH_2\text{-}OH \xrightarrow[-H_2O]{200\text{-}250^0C} HO(CH_2)_2O\text{-}C\text{-}\langle\bigcirc\rangle\text{-}C\text{-}O(CH_2)_2OH + 2H_2O$$

Polymerization

$$HO(CH_2)_2O\text{-}C\text{-}\langle\bigcirc\rangle\text{-}C\text{-}O(CH_2)_2OH \xrightarrow[266Pa]{270\text{-}280^0C} \left[C\text{-}\langle\bigcirc\rangle\text{-}C\text{-}O(CH_2)_2O\right]_n + (n\text{-}1)HO\text{-}CH_2\text{-}CH_2\text{-}OH$$

PET

From above equation, PET molecular structure mainly comprises hydroxyl, methyl and ethenyl. RC structure mainly comprises hydroxyl, methyl and ethenyl also. But these characteristic peaks overlapped in RC-IJP NIR spectra from FigureS3, because of PET molecular structure and RC structure is similar. These characteristic peaks of RC-IJP are weaker than PET molecular structure in NIR spectra from FigureS3.

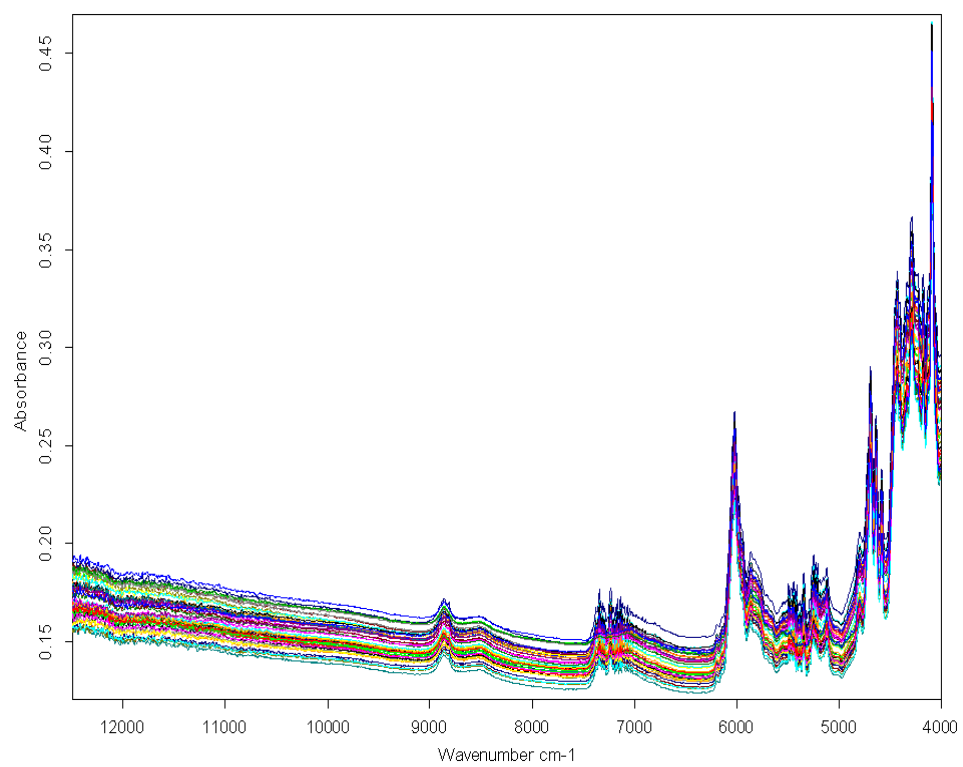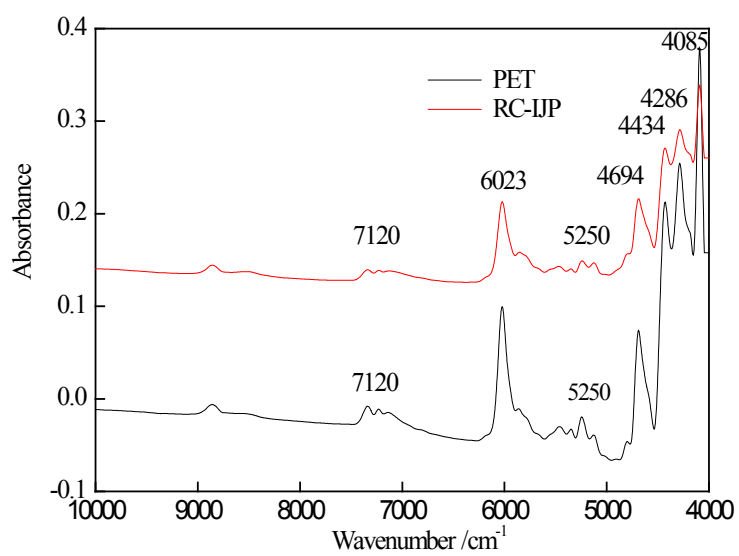Figure. S1   Photograph of NIR instrument

Figure S2 : NIR spectra of 45 samples

Figure S3: NIR spectra of PET and RC-IJP