

## SUPPLEMENTARY MATERIAL

# The effect of zeolite Na-X and Clinoptilolite as functional fillers on the mechanical, thermal and barrier properties of Thermoplastic Polyurethane

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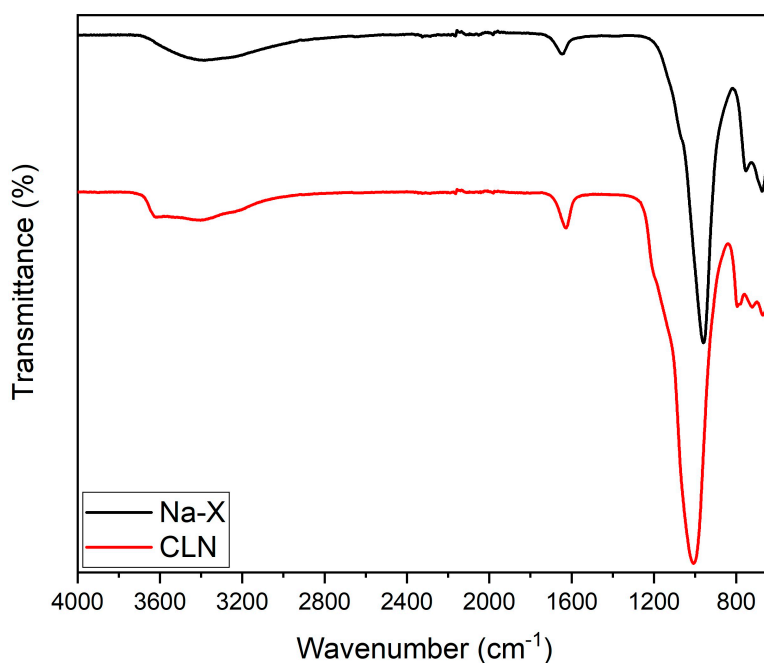
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### Supplementary Materials

SECTION 1	FTIR CHARACTERIZATION
SECTION 2	XRD CHARACTERIZATION
SECTION 3	TGA CHARACTERIZATION
SECTION 4	MECHANICAL CHARACTERIZATION

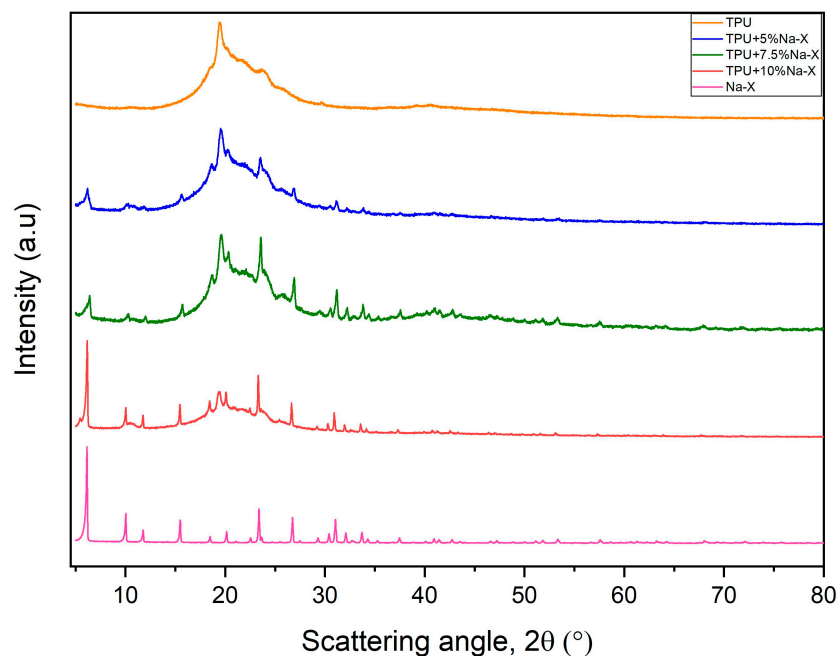
## SECTION 1: FTIR CHARACTERIZATION

FTIR results demonstrate (Figure S1) that both types of zeolites are significantly hydrated which is illustrated by a discrete water transmittance band in the 3500 and 1640  $\text{cm}^{-1}$  region. These bands, which are centered at 3379 (OH group) and 1644  $\text{cm}^{-1}$  for Na-X and 3403 and 1627  $\text{cm}^{-1}$  for Clinoptilolite, refer to water molecules associated with the ions in the channels and cages in the of the zeolite structure [39] (reference of the main manuscript). The zeolite Na-X exhibits other bands appear near at 959  $\text{cm}^{-1}$ , 752  $\text{cm}^{-1}$  and 673  $\text{cm}^{-1}$  ascribed to asymmetric stretching of T-O group (where T= Si or Al), T-O-T group stretching and asymmetric stretching of T-O. For Clinoptilolite, the peaks at 1007  $\text{cm}^{-1}$  and 794  $\text{cm}^{-1}$  correspond to the symmetric and asymmetric stretching of O-T-O group. The other peaks, located at 722 and 671  $\text{cm}^{-1}$  are characteristic of the symmetric stretching of free tetrahedral group  $\text{TO}_4$  [40-43] (references of the main manuscript).

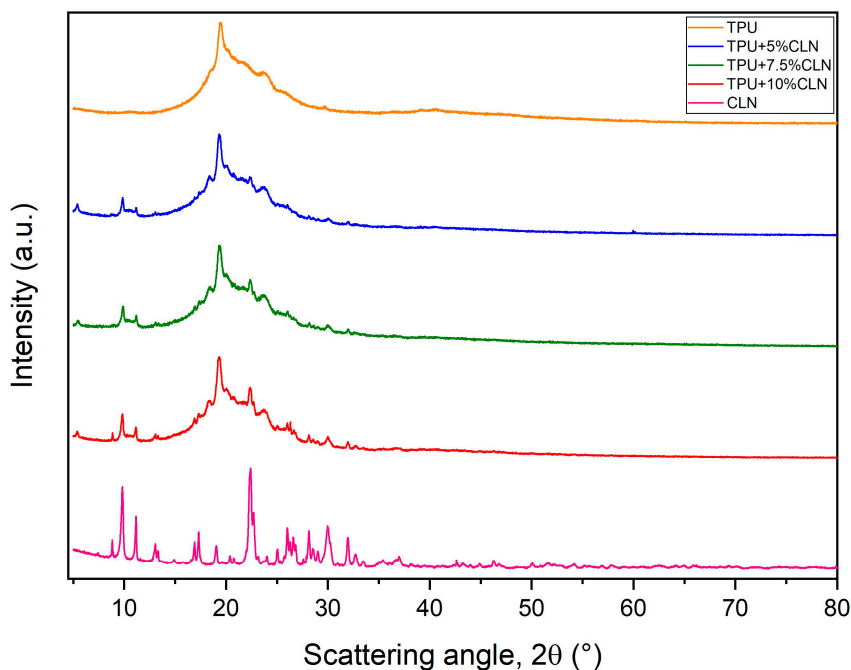


**Figure S1.** ATR spectra of Zeolite Na-X and Clinoptilolite powders

## SECTION 2: XRD CHARACTERIZATION

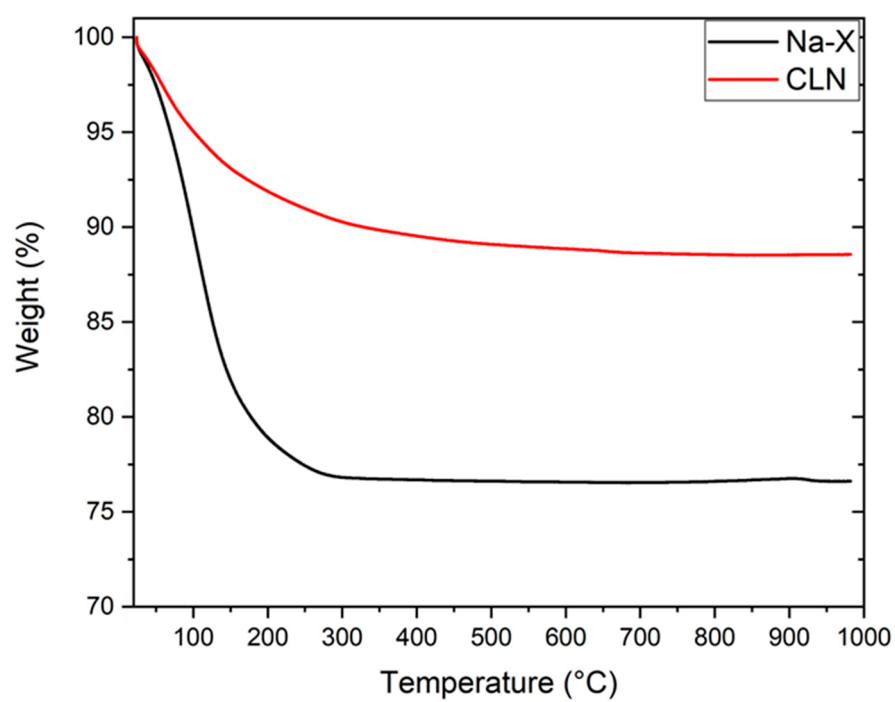


**Figure S2.** XRD spectra of Thermoplastic Polyurethane-TPU +Na-X composites.



**Figure S3.** XRD spectra of Thermoplastic Polyurethane-TPU +CLN composites.

## SECTION 3: TGA CHARACTERIZATION



**Figure S4.** TGA curves of Zeolite Na-X and Clinoptilolite powders.

## SECTION 4: MECHANICAL CHARACTERIZATION

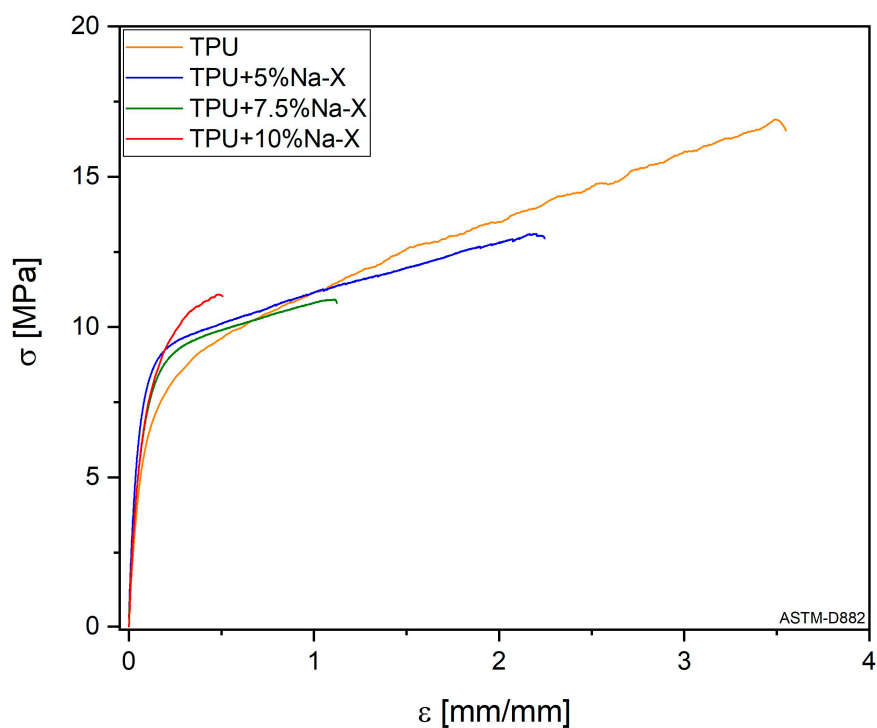


Figure S5. Stress-Strain curves of Thermoplastic Polyurethane-TPU +Na-X composites.

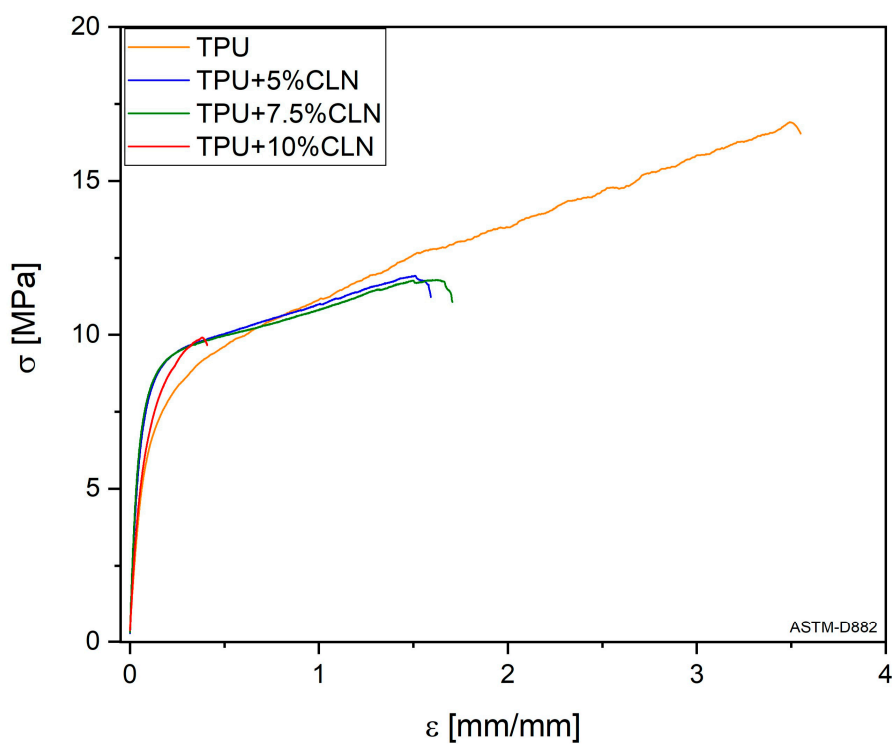


Figure S6. Stress-Strain curves of Thermoplastic Polyurethane-TPU +CLN composites.