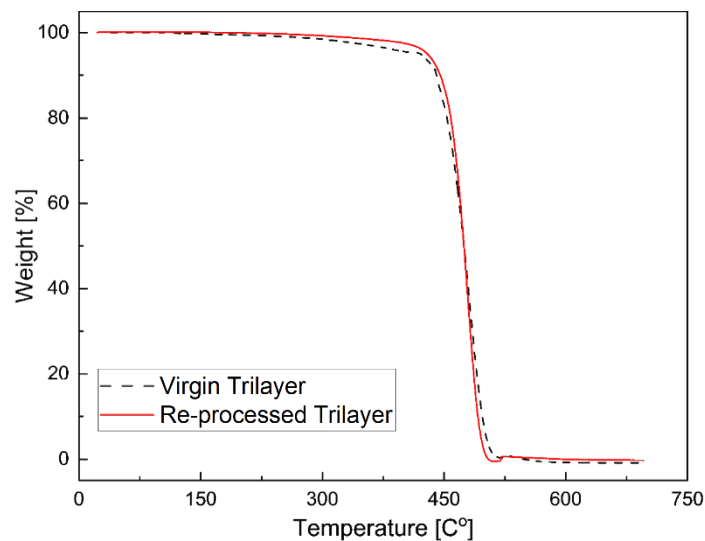
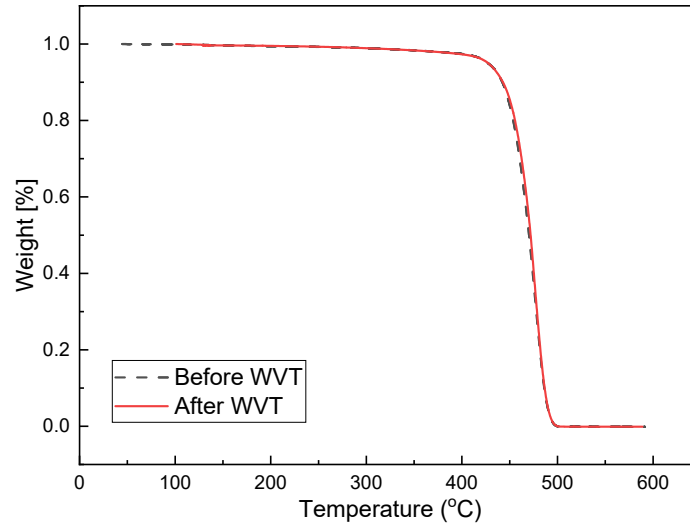


## 1. Supplementary materials

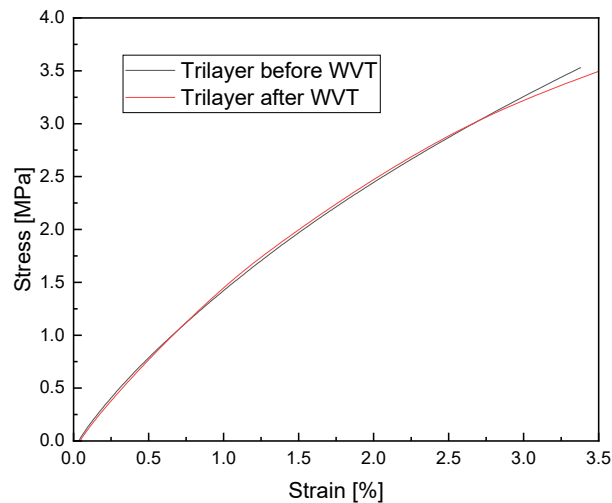
**Supplementary Material 1:** Fabrication method of Trilayer samples. PA12, Blend, and PERT layers were compression molded to 0.34 mm films at 230 °C. The pellets were melted at 230 °C for 5 min, and hot pressed under 5 tons of hydraulic pressure for an additional 5 min. The PA12, Blend, and PERT films were cut from the mold after the air cooling to room temperature. Then, the stacked layers in the order of PA12, Blend, and PERT were compression molded to 1 mm thick Trilayer samples in a vacuum bag at 230 °C for 5 min and then air-cooled.



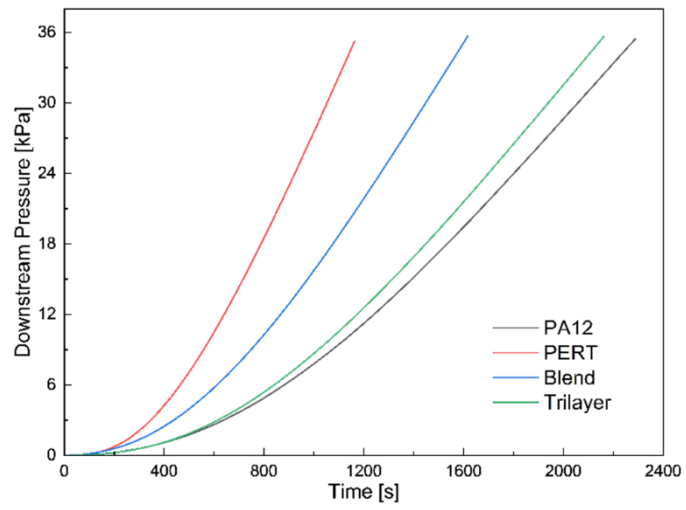
**Supplementary Material 2:** Thermogravimetric analysis of Trilayer specimen virgin and re-processed after twin-screw compounding process for three times. No degradation was observed.



**Supplementary Material 3:** Thermogravimetric analysis of Trilayer specimens before and after WVT where the specimens were exposed to the water vapor at 82 °C for 8 days. Trilayer specimens were dried in oven at 60 °C for 48h before the testing to avoid the effect of moisture. No degradation was observed.



**Supplementary Material 4:** The stress vs strain curves of Trilayer specimens before and after WVT where the specimens were exposed to the water vapor at 82 °C for 8 days. Trilayer specimens were dried in oven at 60 °C for 48h before the testing to avoid the effect of moisture. No degradation was observed.



**Supplementary Material 5:** The example downstream pressure vs time curves of PA12, PERT, Blend and Trilayer