

## Supplementary Material

Thermogravimetric analysis (TGA) was conducted in an N<sub>2</sub> atmosphere with a heating rate of 10°C/min. The Scanning electron microscopy (SEM) testing was performed via a Tescan VEGA XMU, LaB6 filament, Oxford Instruments X-Max 50 SSD detector.

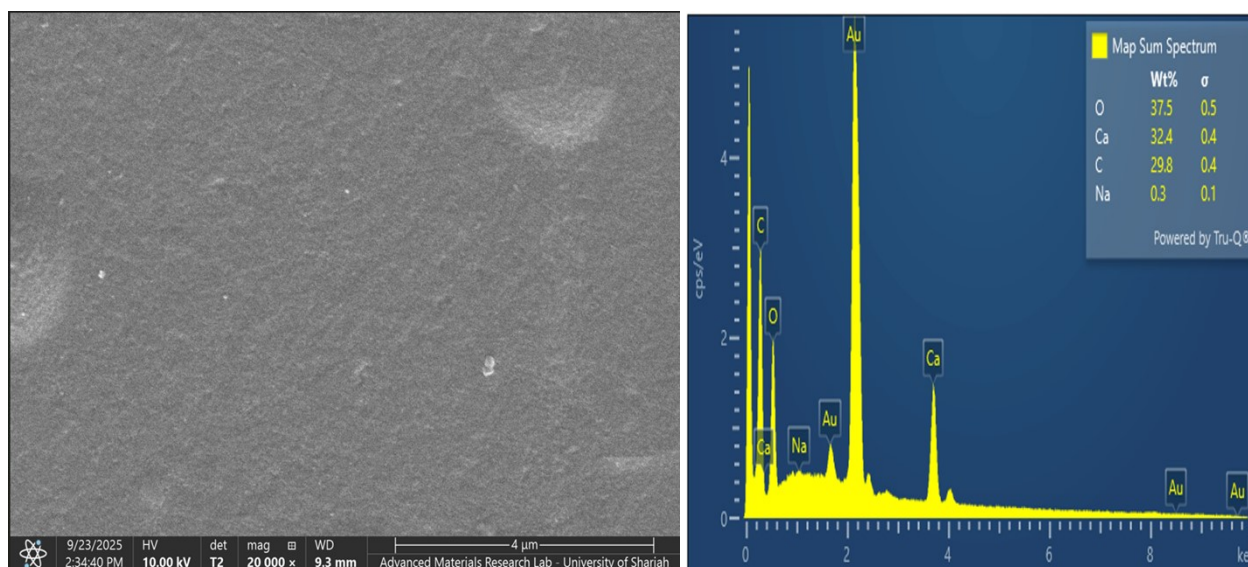


Figure S-1 SEM and EDX for pristine SA membrane.

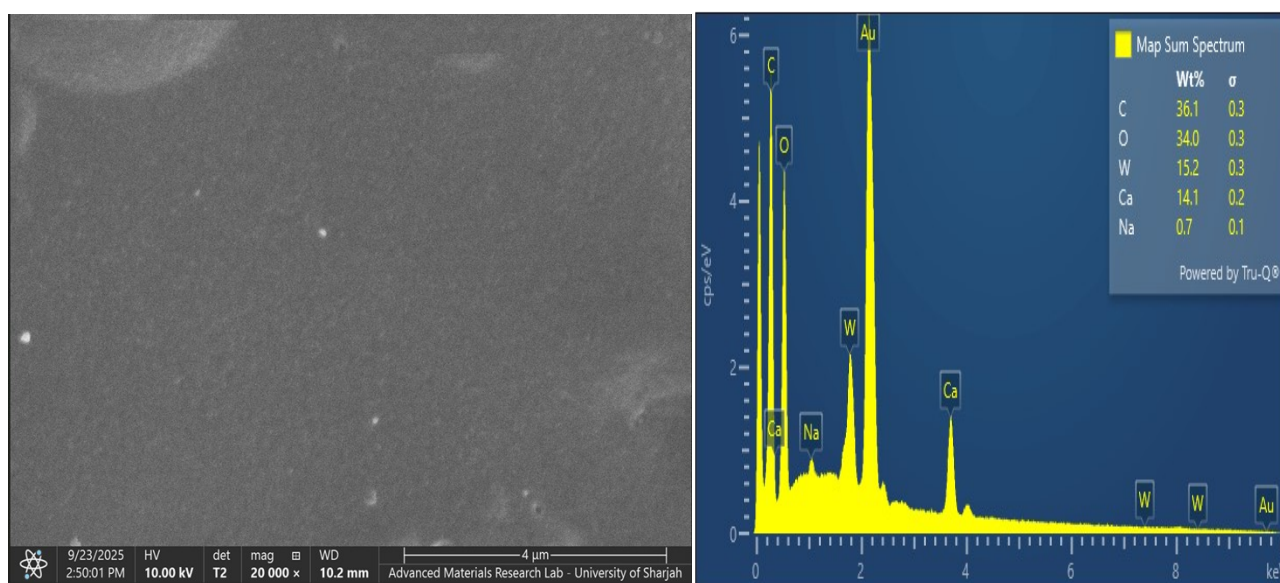


Figure S-2 SEM and EDX for WO<sub>3</sub>-rG/SA membranes.

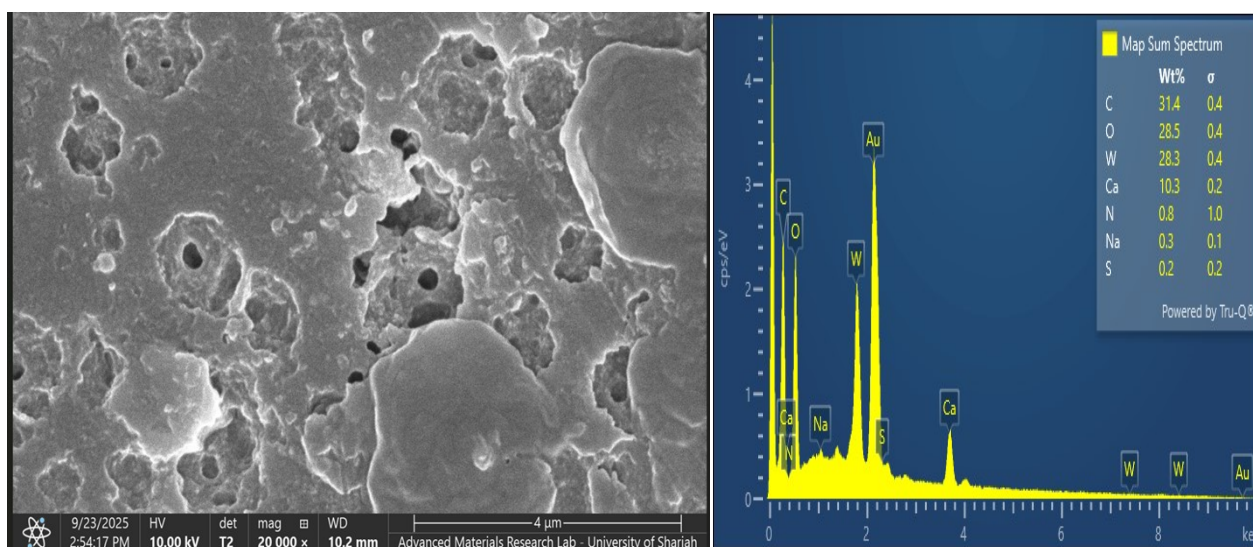


Figure S-3 SEM and EDX for WO<sub>3</sub>-rG/IL/SA membranes.

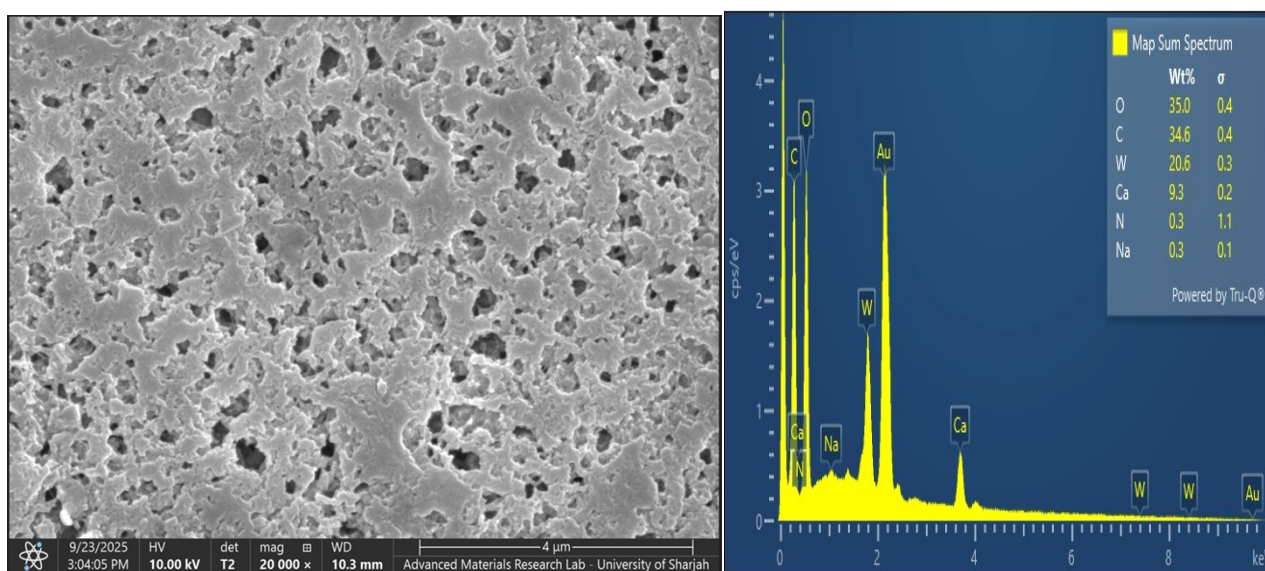


Figure S-4 SEM and EDX for WO<sub>3</sub>-rG/PEG/SA membranes.

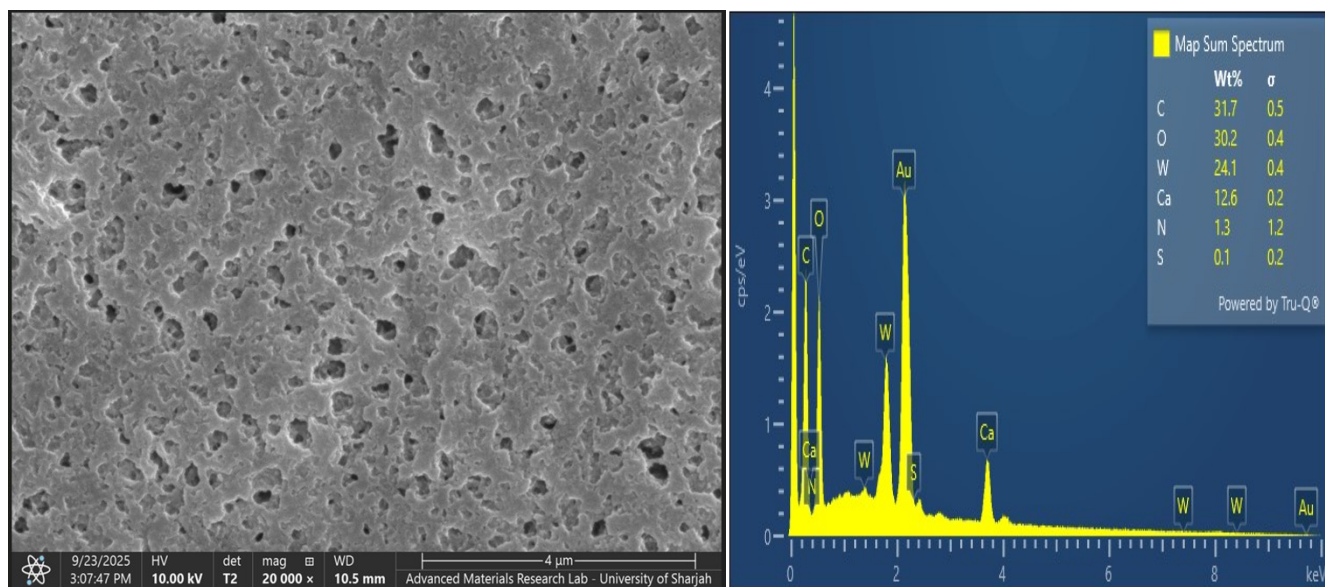


Figure S-5 SEM and EDX for  $\text{WO}_3$ -rG/IL/PEG/SA membranes.

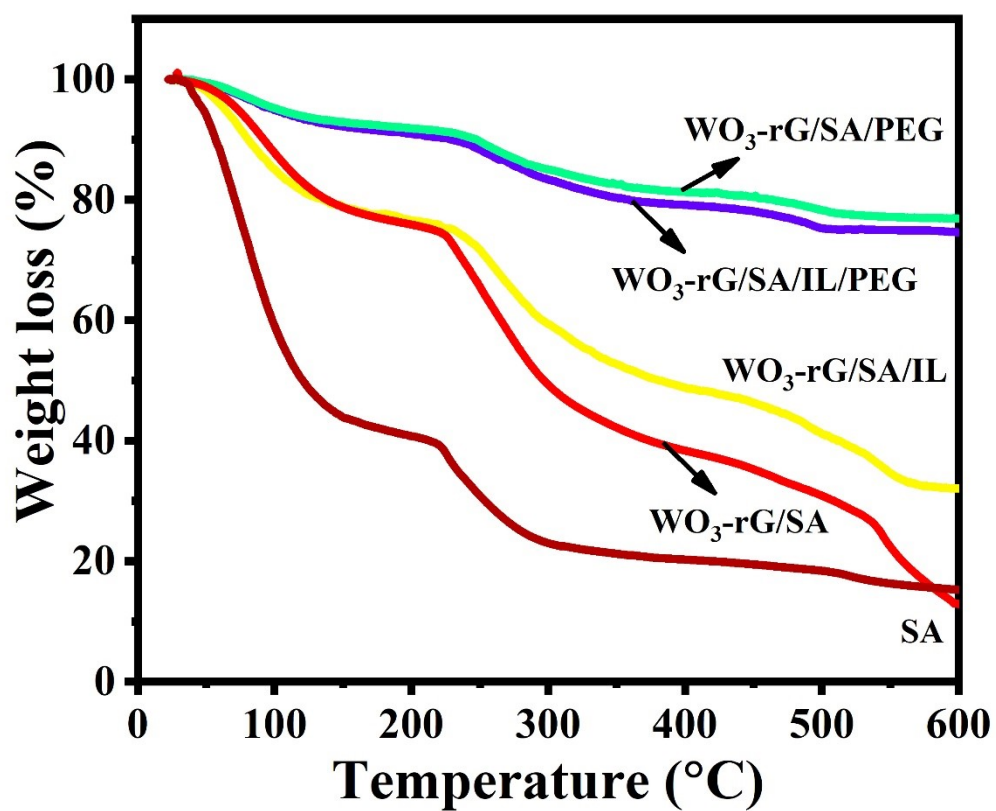


Figure S-6: TGA for the prepared membranes in this work.