Polyaniline-TiO_2 nanocomposite hollow fiber membranes for dye removal applications

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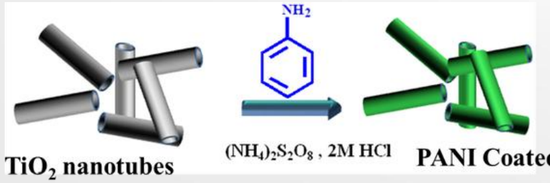
Introduction

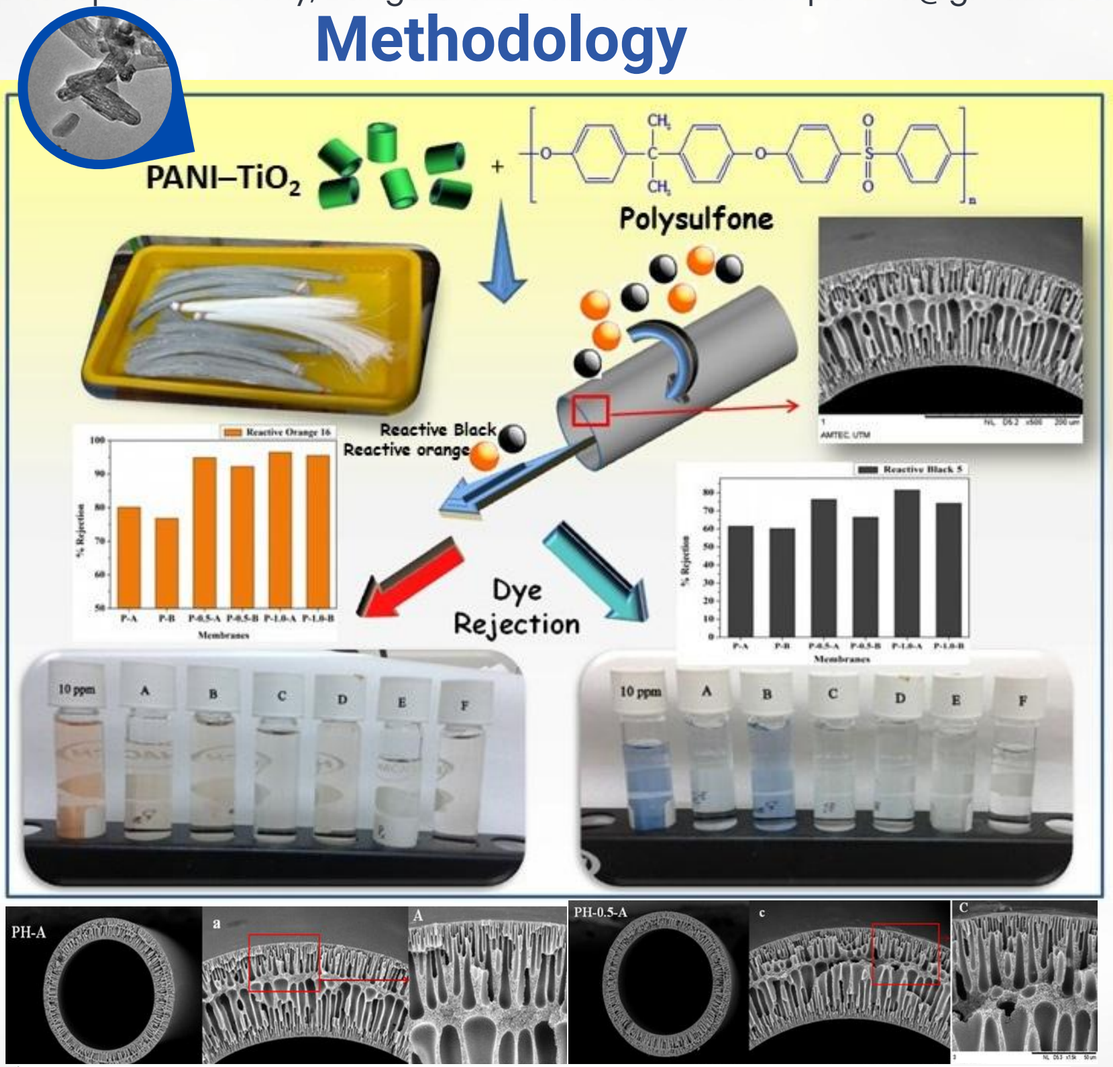
- Water contamination by dye effluents from industries is a major concern
- Hollow fiber (HF) polymer membranes have been used for waste water treatment, dye rejection, due to their selectivity and good productivity
- HF membrane performance can be modified by incorporating nanocomposite additives to achieve desired properties

Preparation

1. Polyaniline (PANI)-TiO_2 nanocomposites are prepared by coating PANI on TiO_2 nanotubes
2. Hollowfiber (HF) membranes are synthesized and modified by incorporating Polyaniline-TiO_2 nanocomposite as additives
3. The effect of addition of PANI-TiO_2 nanocomposite on the performance of Polysulfone HF membranes is studied
4. Membranes showed high dye rejection for Reactive Black 5 and Reactive Orange 16 dyes



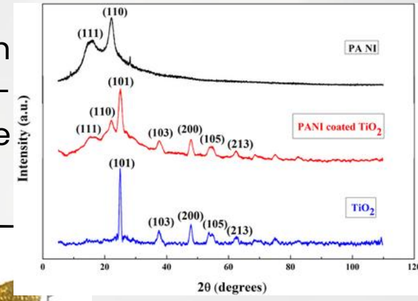
Methodology

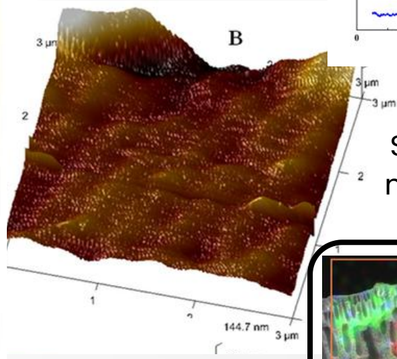


Membrane Code	PH-A	PH-B	PH-0.5-A	PH-0.5-B	PH-1.0-A	PH-1.0-B
Polysulfone (%)	20	20	20	20	20	20
PANI-TiO_2 (wt. %)	0	0	0.5	0.5	1.0	1.0
A and B refers to 5 and 10 cm air gap between the spinneret and the bath respectively						

Results

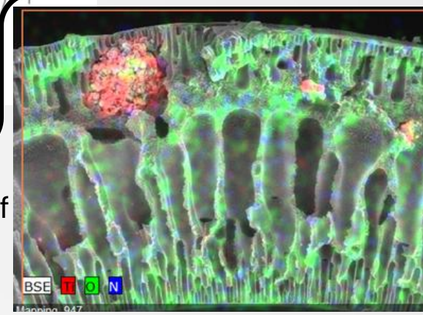
X-Ray diffraction patterns of PANI-TiO_2 nanocomposite





Surface roughness of membrane using AFM

Elemental Mapping of PH-1.0-B membrane



Conclusions

- The membrane (PH-1.0-A) showed a maximum rejection of 81.5% and 96.5% for Reactive Black 5 and Reactive Orange 16 dyes respectively
- PANI-TiO_2 nanocomposite hollow fibre membranes, can be used for dye removal from aqueous solutions by suitably varying the air gap distance and PANI-TiO_2 content