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Nano-cellulose Hydrogel Coated Flexible Titanate-Bismuth Oxide Membrane for Trinity Synergistic Treatment of Super-intricate Anion/Cation/Oily-Water

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2 **Membrane for Trinity Synergistic Treatment of Super-intricate**  
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14 **Abstract:** Taking into account that oil generally hinders the adsorption  
15 performance of adsorbents, the purification of super-intricate wastewater  
16 containing abundant toxic cations, anions and oils is full of challenge. Based on  
17 the synergistic effects of layered titanate nanofibers (TNFs), oxygen vacancy  
18 occupied  $\delta$ -Bi<sub>2</sub>O<sub>3</sub> and surface carboxyl/hydroxy groups uniformly arranged  
19 cellulose, a layer-by-layer assembled nano-cellulose hydrogel coated flexible  
20 titanate-bismuth oxide membrane (CH-TBM) was developed for efficiently  
21 handling this sewage. The cellulose hydrogel top-layer with a pore size lower  
22 than 100 nm ensures the oil phase is resisted (oil contact angle > 150°), while the  
23 water phase can easily and quickly permeate the membrane (water contact angle  
24  $\approx$  0°). And, the TNFs-Bi<sub>2</sub>O<sub>3</sub> sub-layer with a pore size larger than 10  $\mu$ m  
25 guarantees that the toxic anions/cations in the water are capable of efficiently

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