Structural Parameter Control of Sharkskin-Mimetic RO Membranes for Antibiofouling Performance

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Controlling biofouling in the aquatic environment remains a critical issue for desalination and water treatment membranes. We previously demonstrated that the sharkskin-mimetic (Sharklet) surface pattern on the desalination membranes is effective for suppressing biofilm formation. In this study, we designed a series of modified Sharklet patterns to identify the effects of pattern design elements on membrane biofouling and optimize the fouling characteristics of the Sharklet structure. RO membranes with modified Sharklet patterns were produced by micromolding combined with layered interfacial polymerization. The biofouling behavior of the Sharklet-patterned RO membranes was monitored under both static and dynamic conditions, and it was confirmed that the anti-biofouling effect of the Sharklet pattern for the dynamic condition was maximized when unit and pattern spacings were both 2 μm. As a result, we speculate that the combination of the inherent biofouling attribute under static conditions and surface flow characteristics under dynamic conditions resulted in the maximum biofouling resistance at the 2 μm spacings.