Membrane technologies are key enablers of the energy transition

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The hydrocarbon processing industry is in the midst of a major shift in feedstocks, structure, and products. Aggressive carbon abatement targets and intrinsic efficiency advantages from electrification strongly undercut the advantages of fossil fuels, which are the majority product of this industry. However, the existing value of the hydrocarbon infrastructure and the projected rise in demand for chemicals and plastics over the next 50 years suggests that this industry will remain an integral part of our global economic systems throughout the energy transition and perhaps beyond. Membranes – synthetic materials capable of molecular-scale separations of ions, gases, water, and chemicals – are an unlikely hero in the quest to make this industry and others more sustainable. These materials-enabled technologies will play an instrumental role in addressing water scarcity and pollution, carbon capture, green hydrogen, industrial efficiency, and more. In this talk, comments on the future of the refining industry and the important role of membrane separation systems in that future will be discussed in addition to specific research challenges facing membrane technologies.