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Mixing and pumping by pairs of helices in a viscous fluid

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It is difficult to mix and pump fluid in microfluidics devices because the traditional methods of mixing and pumping at large length scales don't work at small length scales. Experimental work has suggested that rotating helical flagella may be used to effectively mix and pump fluid in microfluidics devices. To further explore this idea and to characterize the flow features around rotating helices, we study the hydrodynamic interactions between two rigid helices rotating at a constant velocity. Helices are coupled to a viscous fluid using a numerical method based upon a centerline distribution of regularized Stokeslets, and we analyze the effects of spacing and phase shift on mixing and pumping.

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