

Abstract Submitted  
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**Achieving synchronization with active hybrid materials: Coupling self-oscillating gels and piezoelectric films.** VICTOR V. YASHIN, Department of Chemical Engineering, University of Pittsburgh, STEVEN P. LEVITAN, Department of Electrical and Computer Engineering, University of Pittsburgh, ANNA C. BALAZS, Department of Chemical Engineering, University of Pittsburgh — Our goal is to develop materials that compute by using non-linear oscillating chemical reactions to perform spatio-temporal recognition tasks. The material of choice is a polymer gel undergoing the oscillatory Belousov-Zhabotinsky reaction. The novelty of our approach is in employing hybrid gel-piezoelectric micro-electromechanical systems (MEMS) to couple local chemo-mechanical oscillations over long distances by electrical connection. Our modeling revealed that (1) interaction between the MEMS units is sufficiently strong for synchronization; (2) the mode of synchronization depends on the number of units, type of circuit connection (serial or parallel), and polarity of the units; (3) each mode has a distinctive pattern in phase of oscillations and generated voltage. The results indicate feasibility of using the hybrid gel-piezoelectric MEMS for oscillator based unconventional computing.

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