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A Tunable Chemical Pattern Filter Constructed by Networks of Reaction Compartments and Tubes LUDVIG LIZANA, ZORAN KONKOLI, Dept. Applied Physics, Chalmers Univ. Tech., Sweden, OWE ORWAR, Dept. Physical Chemistry, Chalmers Univ. Tech., Sweden — We study numerically the filtering capabilities of nanoscale networks built up of containers and tubes hosting chemical reactions. Spatio-temporal patterns of substrate molecules are injected into the network. The substrate propagates by diffusion and reacts with enzymes distributed in the network prior to the injections. The dimensions of the network are tailored in a way that the transport and reaction rates are comparable in size, a situation in which the overall behavior is highly influenced by the geometry and topology of the network. This property is crucial for the functionality of the pattern filter developed in here. It is demonstrated that input patterns can be classified in a crude way using a simple setup (two micrometer-sized containers joined together by a nanotube) and that the classification can be tuned by changing the geometry of the network (the length of the tube connecting the two containers). The filter device we investigate can also be viewed as a primitive chemistry-based computational element since the information encoded in the input patterns is processed using chemical reactions. In particular it is argued that the filter can be used as a frequency sensor.

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