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First observation of the first-order transition in ultra-filtration of flexible linear polymer chains[1] CHI WU, FAN JIN, The Chinese University of Hong Kong — Using a special double-layer membrane to avoid interaction among flow fields generated by different pores, we have, *for the first time*, observed the predicted discontinuous first-order transition in ultra-filtration of flexible linear polymer chains. Namely, the chain could pass through a pore much smaller than its unperturbed radius only when the flow rate is higher than a certain value. When only one chain and one pore considered in theory, such a threshold is surprisingly independent of both the chain length and the pore size. Our results reveals that for a membrane with many pores and at a microscopic flow rate (q) lower than the threshold, the inevitable blocking of some pores by longer non-stretched coiled chains increases q in those non-blocked pores because the macroscopic flow rate (Q) is a constant. Long chains have two populations, coiled and stretched, in a real ultra-filtration experiment when q is lower than the threshold.

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