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High transconductance organic electrochemical transistors

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www.nature.com/naturecommunications. The development of transistors with high gain is essential for applications ranging from switching elements and drivers to transducers for chemical and biological sensing. Organic transistors have become well-established based on their distinct advantages, including ease of fabrication, synthetic freedom for chemical functionalization, and the ability to take on unique form factors. These devices, however, are largely viewed as belonging to the low-end of the performance spectrum. Here we present organic electrochemical transistors with a transconductance in the mS range, outperforming transistors from both traditional and emerging semiconductors. The transconductance of these devices remains fairly constant from DC up to a frequency of the order of 1 kHz, a value determined by the process of ion transport between the electrolyte and the channel. These devices, which continue to work even after being crumpled, are predicted to be highly relevant

as transducers in biosensing applications.