

## Liquid In Situ Electrochemical Nuclear Magnetic Resonance (EC-NMR) Spectroscopy to Study Electrochemical Processes

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Since the strength of nuclear magnetic resonance (NMR) to noninvasively realize the structural elucidation and quantitative analysis of small organic molecules, in principle, liquid in situ electrochemical NMR (EC-NMR) possesses great advantages for real-time investigation of electrochemically generated solution species. However, the intrinsic incompatibility between the coupling techniques, as well as the sophisticated setups modification still limit the effective applications in a wide range. To overcome these bottlenecks, herein we propose easy-to-construct designs, meanwhile with improved electrochemical and NMR performances. As proof of concepts, model experiments including redox reaction and alcohols electrooxidation are utilized to test the capacity of liquid in situ EC-NMR. This work demonstrates the universality and effectivity of the proposed platform to develop liquid in situ EC-NMR as a useful tool for the analysis of electrocatalytic dynamic processes at a molecular level.

### References

- [1] Y. J. Tong, *Curr. Opin. Electrochem.* 2017, 4, 60-68.
- [2] S.-H. Cao, Z.-R. Ni, L. Huang, H.-J. Sun, B. Tang, L.-J. Lin, Y.-Q. Huang, Z.-Y. Zhou, S.-G. Sun, Z. Chen, *Anal. Chem.* 2017, 89, 3810-3813
- [3] Z.-R. Ni, X.-H. Cui, S.-H. Cao, Z. Chen, *AIP Adv.* 2017, 7, 085205.
- [4] Y.-Q. Huang, S.-H. Cao, Y. Yang, S.-H. Cai, H. Zhan, C.-H. Tan, L. Lin, Z.-Y. Zhang, Z. Chen, *Anal. Chem.* 2017, 89, 7115-7122.