

## **ENDOR study of nitrogen hyperfine and quadrupole tensors in vanadyl porphyrins of heavy crude oil**

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### **Abstract**

© Kazan Federal University (KFU). We report the observation of pulsed electron-nuclear double resonance (ENDOR) spectrum caused by interactions of the nitrogen nuclei  $^{14}\text{N}$  with the unpaired electron of the paramagnetic vanadyl complexes  $\text{VO}_2^+$  of vanadyl porphyrins in natural crude oil. We provide detailed experimental and theoretical characterization of the nitrogen hyperfine and quadrupole tensors.

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### **Keywords**

Crude oil, DFT, ENDOR, EPR, Vanadyl porphyrins