Supporting information for the article:

Synthesis, characterization and testing of a new V$_2$O$_5$/Al$_2$O$_3$–MgO catalyst for butane dehydrogenation and limonene oxidation.

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This file includes the IR studies of the bare support, catalysts A and B, the XRD pattern of catalysts A-C, the EPR studies are presented for catalyst A and B at 298 K and for catalyst A at 20 K and 70 K as well as the reduced catalyst A at 298 K. We also include the TPR profile of vanadium pentoxide and the experimental procedure for performing the leaching tests.

1. IR Studies

![IR Spectra](image-url)

Figure S1: IR spectra of the support and the catalysts A and B.
2. XRD studies

Figure S2: X-ray diffraction patterns of catalysts A-C

- Al₂O₃-MgO: XRD pattern for the bare support
- A) XRD pattern for catalyst A: 5 wt% V₂O₅ on MgO-Al₂O₃ support
- B) XRD pattern for catalyst B: 10 wt% V₂O₅ on MgO-Al₂O₃ support
- C) XRD pattern for catalyst C: 15 wt% V₂O₅ on MgO-Al₂O₃ support
3. EPR studies

Figure S3: EPR spectra of catalysts A and B at 298 K.

Figure S4: EPR spectra of catalyst A at 20 K and 70 K.
Figure S5: EPR spectrum of the reduced catalyst A recorded at 298 K, after keeping the catalyst two weeks at ambient conditions.

4. TPR measurements

Figure S6: Temperature programmed reduction profile of V$_2$O$_5$
5. Leaching test

The reaction conditions are: 1.2 ml (6.2 mmol) limonene, 6.0 ml H₂O₂ (35.5%, aq.; molar ratio 8:1 H₂O₂:limonene), 1.3 ml (12.4 mmol) benzonitrile; 0.025 g catalyst; 40 ml acetone:2-butanol (ratio 2:8), 65 °C, 6 h. The quantitative GC-analysis is performed using an external standard (anisole) calibration.

![Conversion vs Time Graph](image)

Figure S7: Leaching test of catalyst B. Catalyst is filtered off after 60 min reaction time.