

### NMR spectroscopy

$^1\text{H}$  NMR spectra were measured on a Bruker DPX-250 spectrometer at 250.13 MHz in 5 mm glass tubes. Measurement parameters: spectral width 5 kHz, acquisition frequency 0.2 Hz,  $45^\circ$  pulse at 4.1  $\mu\text{s}$ .

#### *Diallyl sulfoxide*

$^1\text{H}$  NMR ( $\text{CCl}_4$ ):  $\delta$  3.18-3.56 (m, 4H), 5.23-5.54 (m, 4H), 5.70-5.98 (m, 2H).

#### *Pentamethylene sulfoxide*

$^1\text{H}$  NMR ( $\text{CCl}_4$ ):  $\delta$  2.59-2.74 (m, 4H) 1.54-1.64 (m, 6H);

#### *Pentamethylene sulfone*

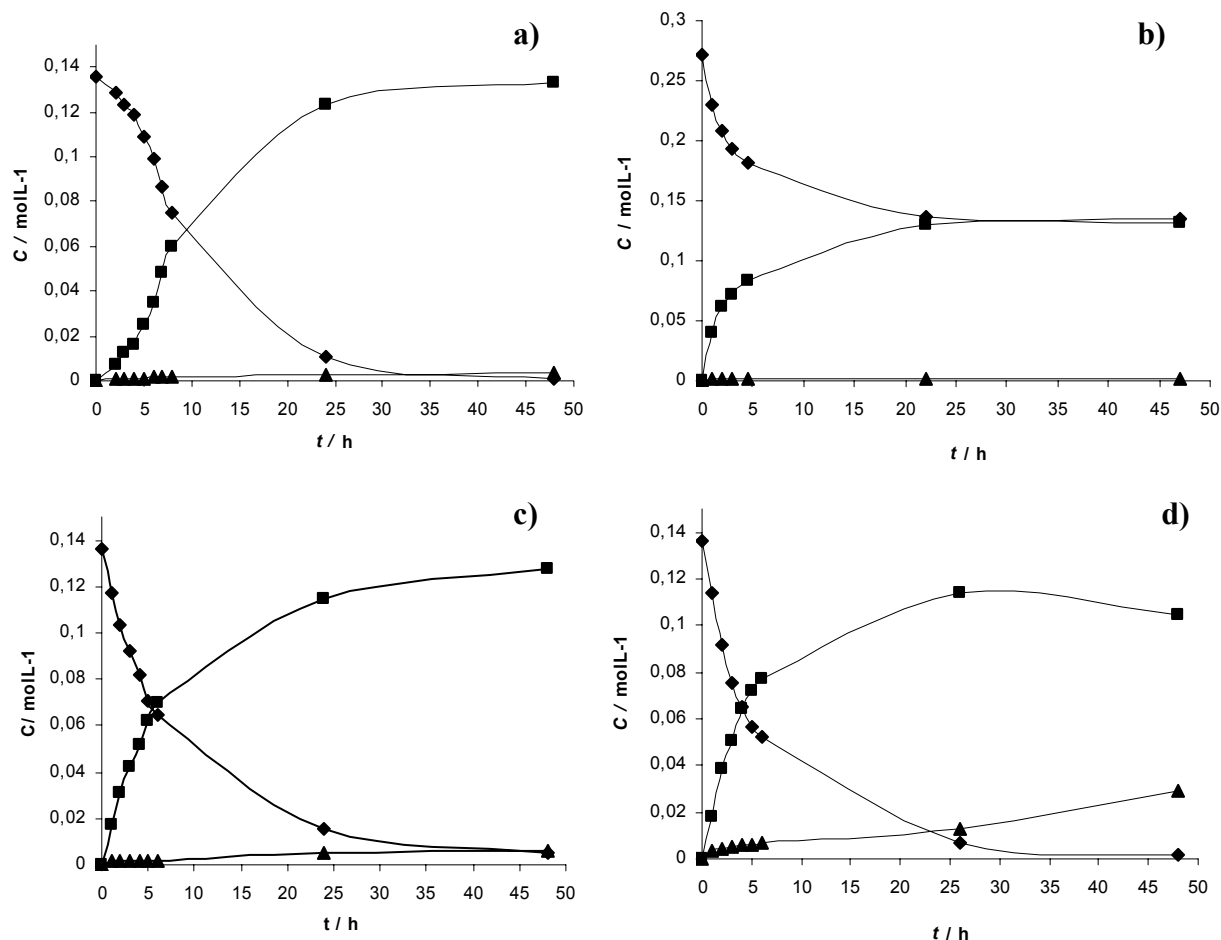
$^1\text{H}$  NMR ( $\text{CCl}_4$ ):  $\delta$  2.75-2.92 (m, 4H), 1.98-2.15 (m, 4H), 1.54-1.69 (m, 2H);

#### *4-(methylsulfinyl)butan-1-ol*

$^1\text{H}$  NMR ( $\text{CDCl}_3$ ):  $\delta$  3.72 (t, 2H,  $J = 6.2$  Hz), 2.93-2.69 (m, 2H), 2.61 (s, 3H), 1.98-1.68 (m, 5H).

Selected  $^1\text{H}$  NMR data of alkyl aryl sulfoxides and sulfones ( $\text{CCl}_4$ ):  $\delta$   $\text{PhSOCH}_3$  2.61 (s, 3H);  $\text{PhSO}_2\text{CH}_3$  2.92 (s, 3H); *p*- $\text{BrPhSOCH}_3$  2.69 (s, 3H); *p*- $\text{BrPhSO}_2\text{CH}_3$  3.05 (s, 3H);  $\text{PhSOCH}_2\text{Ph}$  3.90 (m, 2H);  $\text{PhSO}_2\text{CH}_2\text{Ph}$  4.15 (s, 2H);  $\text{PhCH}_2\text{SOCH}_2\text{Ph}$  3.75 (m, 2H).  $^1\text{H}$  NMR ( $\text{CDCl}_3/\text{CCl}_4=1:1$ ):  $\delta$  *p*- $\text{NO}_2\text{PhSOCH}_3$  2.78 (s, 3H), *p*- $\text{NO}_2\text{PhSO}_2\text{CH}_3$  3.08 (s, 3H).

**Oxidation of tetrahydrothiopyran by H<sub>2</sub>O<sub>2</sub> in the presence of Zn(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O**



**Fig. 1S** Oxidation of tetrahydrothiopyran by H<sub>2</sub>O<sub>2</sub> in the presence of Zn(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O (0.1 eq. of Zn) in acetonitrile: a) R<sub>2</sub>S:H<sub>2</sub>O<sub>2</sub>=1:1, H<sub>2</sub>O<sub>2</sub> was added in parts in two hours; b) R<sub>2</sub>S:H<sub>2</sub>O<sub>2</sub>=2:1; c) R<sub>2</sub>S:H<sub>2</sub>O<sub>2</sub>=1:1, with H<sub>2</sub>O(20 μL); d) R<sub>2</sub>S:H<sub>2</sub>O<sub>2</sub>=1:1.5.

**Catalytic oxidation of diaryl sulfides by H<sub>2</sub>O<sub>2</sub> in the presence of Zn(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O**

**Table 1S** Catalytic oxidation of diaryl sulfides by H<sub>2</sub>O<sub>2</sub> in the presence of Zn(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O.

No	Substrate	Conversion, % <sup>a</sup>	Selectivity, % <sup>b</sup>
1	PhSCH <sub>2</sub> Ph	80	99.8
2	PhCH <sub>2</sub> SCH <sub>2</sub> Ph	97	99.5

Reaction conditions: sulfide (0.17 mmol), Zn(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O (0.017 mmol) and 30% aqueous H<sub>2</sub>O<sub>2</sub> (0.2 mmol) in CH<sub>3</sub>CN (1.5 mL), 16 h at room temperature.

<sup>a</sup> Conversion = 100% \* ([RSOR'] + [RSO<sub>2</sub>R']) / ([RSOR'] + [RSO<sub>2</sub>R'] + [RSR']).

<sup>b</sup> Selectivity = 100% \* [RSOR'] / ([RSOR'] + [RSO<sub>2</sub>R']).