SUPPLEMENTARY INFORMATION

for

A tri-functional vanadium(IV) complex to detect cysteine oxidation
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1. LC-MS and $^1$H NMR for dipicolinic intermediates 2-6 and 9-12

**Dipicolinate 2**

![Graph and structural formula of Dipicolinate 2]

- **Compound:** Dipicolinate 2
- **Mass:** C$_{42}$H$_{31}$N$_{11}$O$_{13}$, MW: 825.92
- **Found Mass:** 848.00, 828.00
- **Time:** 2.40

**Dipicolinate 3**

![Graph and structural formula of Dipicolinate 3]

- **Compound:** Dipicolinate 3
- **Mass:** C$_{39}$H$_{31}$N$_{9}$O$_{9}$, MW: 603.67
- **Found Mass:** 626.00, 604.00
- **Time:** 1.33

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**Table of Mass Spectral Data**

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**Table of Mass Spectral Data**

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Dipicolinate 10

![Mass Spectrogram](image)

Peak ID | Compound | Time | Mass Found
--- | --- | --- | ---
1 | TOF MS ES+ :626+604 | 9.6e+003

(2)
93%
603.0 (41%) 1.3

C_{10}H_{14}N_{2}O_{6}
MW: 603.66

Dipicolinate 11

![Mass Spectrogram](image)

Peak ID | Compound | Time | Mass Found
--- | --- | --- | ---
1 | TOF MS ES+ :778+756 | 5.7e+004

(11)
85%
755.0 (51%) 1.4

C_{14}H_{16}N_{2}O_{6}
MW: 755.81
Dipicolinate 10

Dipicolinate 11
2. LC-MS, HRMS and $^1$H NMR for fully protected dipicolinate 14
Elemental Composition Report

Single Mass Analysis
Tolerance = 10.0 PPM / DBE: min = -1.5, max = 50.0
Element prediction: Off
Number of isotope peaks used for i-FIT = 3

Monoisotopic Mass, Even Electron Ions
328 formula(e) evaluated with 1 results within limits (all results up to 1000) for each mass
Elements Used:
C: 43-43 H: 0-200 N: 0-10 O: 0-14 Na: 0-1

Minimum: 5.0 10.0 50.0
Maximum: -1.5

Mass   Calc. Mass   mDa   PPM   DBE   i-FIT   i-FIT (Norm)   Formula
858.3203 858.3198 0.5 0.6 22.5 105.7 0.0  C43 H48 N5 O14
3. LC-MS, HRMS, $^1$H/$^{13}$C/COSY/HSQC NMRs, UV/vis and emission for ligand 15
Figure S1. Analytical chiral HPLC profiles of ligand 15. Stationary phases (columns): amylose tris(3,5-dimethylphenylcarbamate) (Lux Amylose-1), cellulose tris(3,5-dimethylphenylcarbamate) (Lux Cellulose-1), and cellulose tris(4-methylbenzoate) (Lux Cellulose-3); eluents: n-Hex/IPA and CH$_3$CN/IPA 90:10; flow rate: 1.0 mL/min; temperature: 25°C; UV detection: 254 nm.
4. ESI-MS, MALDI, UV/vis for VO(pic) complex 16
Figure S2. $^{51}$V NMR spectrum of 16 (3 mg) recorded after 72 h in solution (DMSO-d6, ca. 400 μL).
Figure S3. Linear plots for the calculation of fluorescence quantum yields for 15 and 16. The gradient of each plot (IF vs A) is proportional to the quantum yield of the sample. For each test sample, the $\Phi_F$ value is obtained relevant to the standard (quinine sulphate) and represents the quantum yield value calculated.

Figure S4. LMW-PTP activity (as an e.g. for all phosphatases) in the presence of OMFP as a substrate. Four slope lines represent measurements of OMFP hydrolysis in the presence of LMW-PTP-GST (0.05 – 0.42 μg). Horizontal line corresponds to the background measurements in the absence of LMW-PTP. High values of the slopes indicate high LMW-PTP phosphatase activity.
Figure S5. IC$_{50}$ curves (values nM ± standard deviation of triplicate repeats) of dimeredone-based VO(pic)$_2$ complex 16 for PTP1B (= protein-tyrosine phosphatase 1B), SHP-2 (= Src homology region 2 domain-containing phosphatase-2), LMW-PTP (= low molecular weight protein tyrosine phosphatase), and VHR (= dual specificity protein phosphatase 3).

Figure S6. IC$_{50}$ curves (values nM ± standard deviation of triplicate repeats) of VO(pic)$_2$ (reference compound, Figure 1 - main text) and new dimeredone-based VO(pic)$_2$ complex 16 for PTEN (= phosphatase and tensin homolog).
**Figure S7.** Live cell uptake of 16 (flow cytometry). Live HCT116 were treated with 10-200 μM of 16 for 24 hours. Flow cytometry histogram (A) and dotplot (B) show no significant increase of fluorescence in HCT116 cells after 24 hours treatment with 16, indicating that there is no detectable uptake of 16 in live HCT116 cells. Untreated cells are shown in Red. 10000 cells were measured for each analysis. Autofluorescence was measured in the absence of 16 (0 μM).

**Figure S8.** Cytotoxicity of 16. HCT116 cells were treated with 100 nM PMA and 0 - 200 μM of 16 for 7.5, 24 or 48 hours. Cell viability was measured by MTS assay. Data shown in average of triplicates ± SD%.
Figure S9. Live cell uptake of 16 + PMA (flow cytometry). Live HCT116 cells were co-treated with 100 nM PMA and 200 μM of 16 for 1 and 6 hours. Flow cytometry histograms show increase of fluorescence in HCT116 cells after 6 hours co-treatment (i.e. PMA + 16), indicating that PMA treatment facilitates the uptake of 16 in HCT116 cells. Untreated cells are shown in Red. 10000 cells were measured for each analysis.

Figure S10. Live cell uptake of 16 + PMA (microscopy). Live HCT116 cells were co-treated with 100 nM PMA and 200 μM of 16 for 6, showing increase of fluorescence and indicating that PMA treatment facilitates the uptake of 16. Untreated cells are shown at 6 hours (i.e. no incubation with PMA + 16). Quantification of fluorescence signal was performed with FIJI.
**Figure S11.** Flow cytometry histogram of HCT116 cells incubated with 16 under oxidative conditions. Live cells were co-treated with 100 nM PMA and 16 (200 μM) for 6 hours following by addition of 0 or 1 mM of H$_2$O$_2$ for 30 min. Cells treated with 1 mM H$_2$O$_2$ (Green) show an increase in fluorescence intensity compared to the control (i.e. no H$_2$O$_2$, Blue). Untreated cells (no 16, no H$_2$O$_2$) are shown in Red. 10000 cells were measured for each analysis.

**Figure S12.** Emission spectra for 16 in the absence/presence of H$_2$O$_2$ for 30 min. A) Fluorescence emission of 16 (200 μM) in PBS. B) Fluorescence emission of 16 (200 μM) + 30% H$_2$O$_2$ (1mM) in PBS after 30 minutes.