

# Synthesis, spectral characterizatcs, sensing properties and microbiological activity of new water soluble

## 4-sulfo-1,8-naphthalimides

Awad I. Said <sup>1, 2</sup>, Desislava Staneva<sup>3\*</sup>, Evgenia Vasileva-Tonkova<sup>3</sup>, Petar Grozdanov<sup>3</sup>, Ivanka Nikolova<sup>3</sup>, Radostina Stoyanova<sup>4</sup>, Albena Yordanova<sup>1</sup>, Ivo Grabchev<sup>1\*</sup>

<sup>1</sup> Faculty of Medicine, Sofia University "St. Kliment Ohridski", 1407 Sofia, Bulgaria

<sup>2</sup> Department of Chemistry, Faculty of Science, Assiut University, Assiut 71516, Egypt

<sup>3</sup> Department of Textile, Leather, and Fuels, University of Chemical Technology and Metallurgy, 1756 Sofia, Bulgaria

<sup>4</sup> Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences, 1113, Sofia, Bulgaria

<sup>5</sup> The Stephan Angeloff Institute of Microbiology, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria

\* Correspondence: grabcheva@mail.bg (D.S.), i.grabchev@chem.uni-sofia.bg (I.G.)

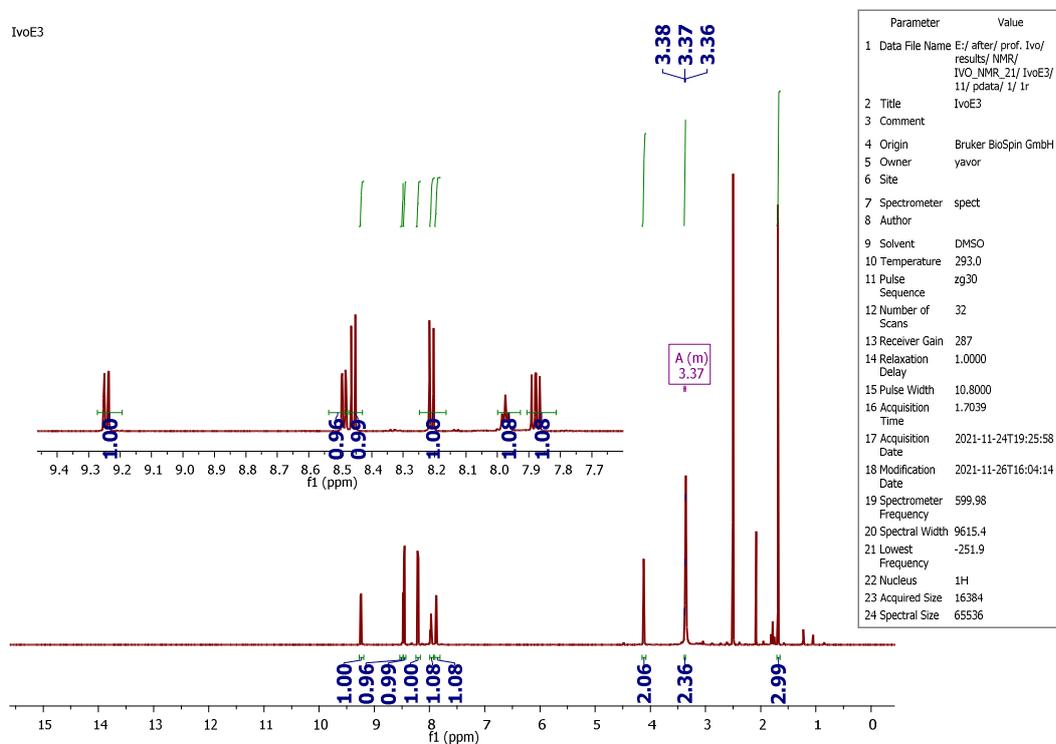


Figure S1. <sup>1</sup>H-NMR spectrum of MSNI

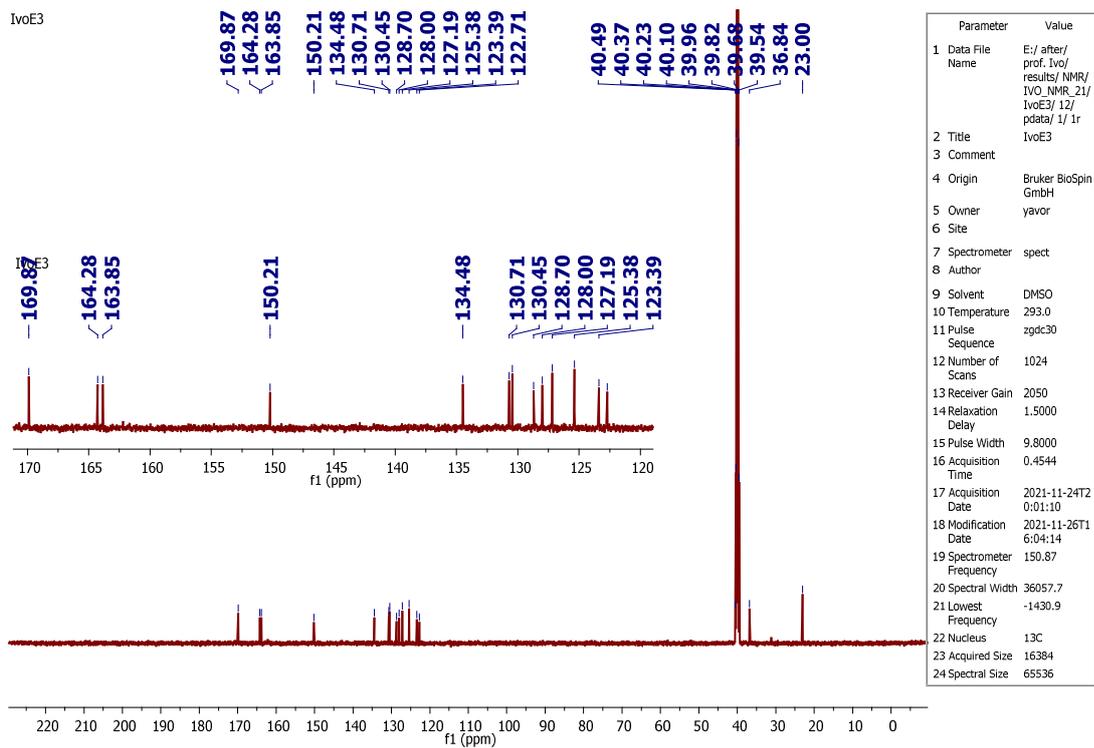


Figure S2. <sup>13</sup>C-NMR spectrum of MSNI

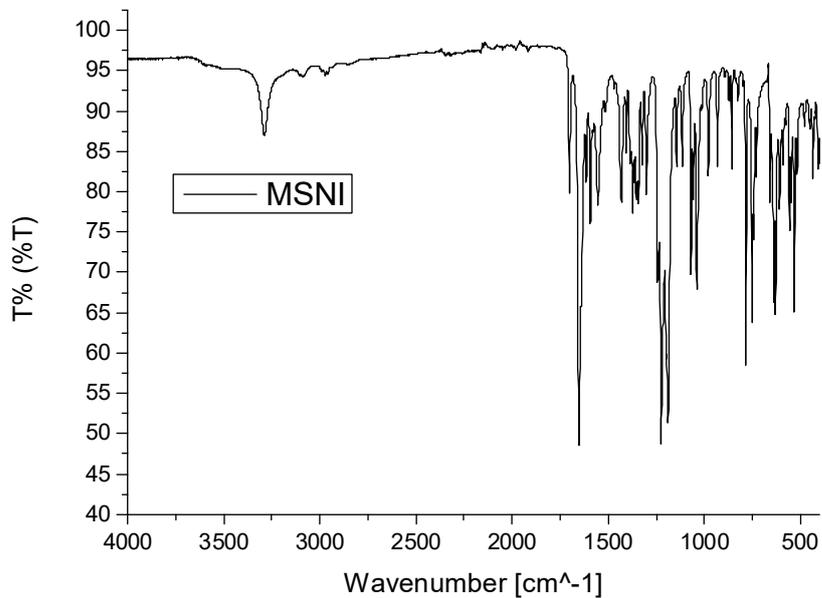


Figure S3. FT-IR spectrum of DSNI

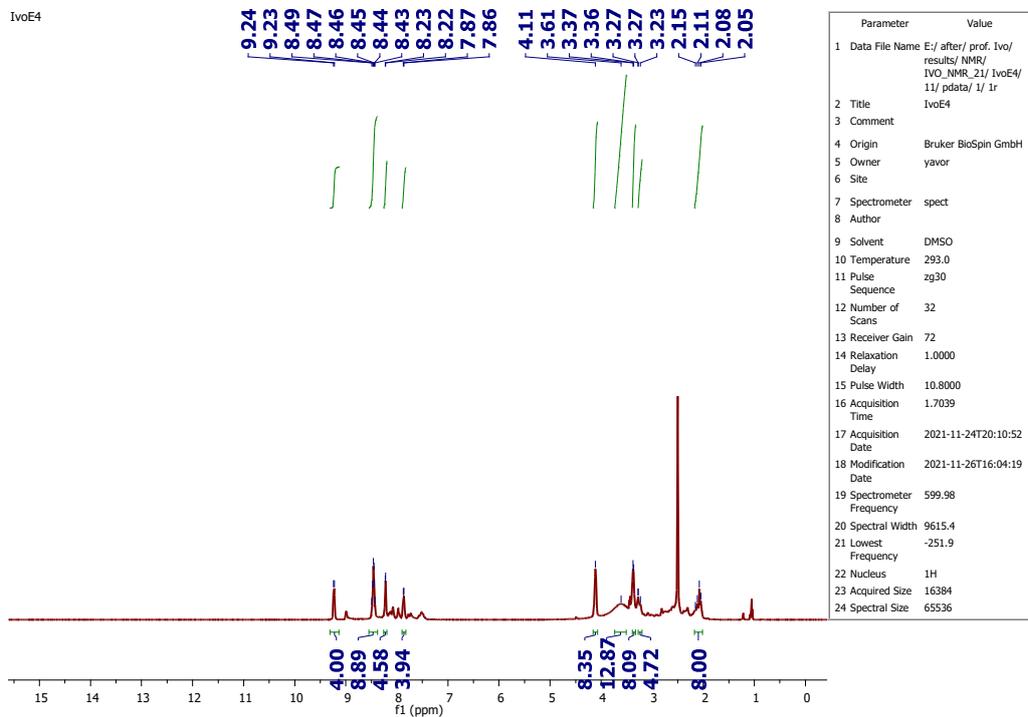


Figure S4. <sup>1</sup>H-NMR spectrum of DSNi

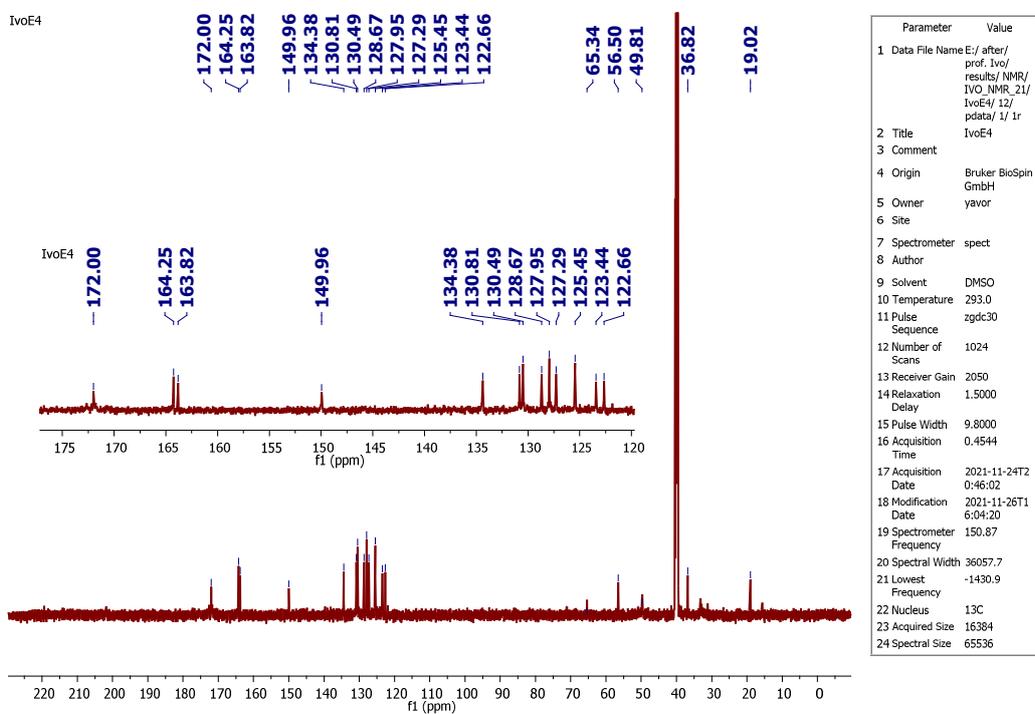
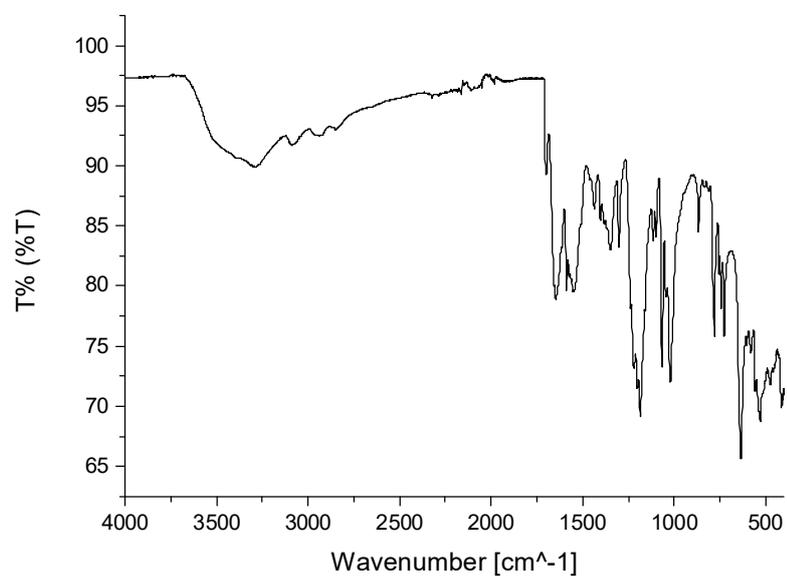
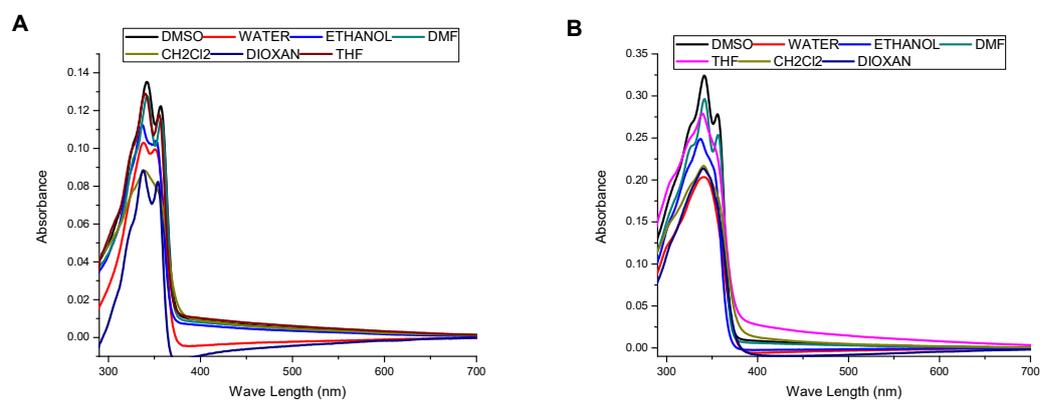


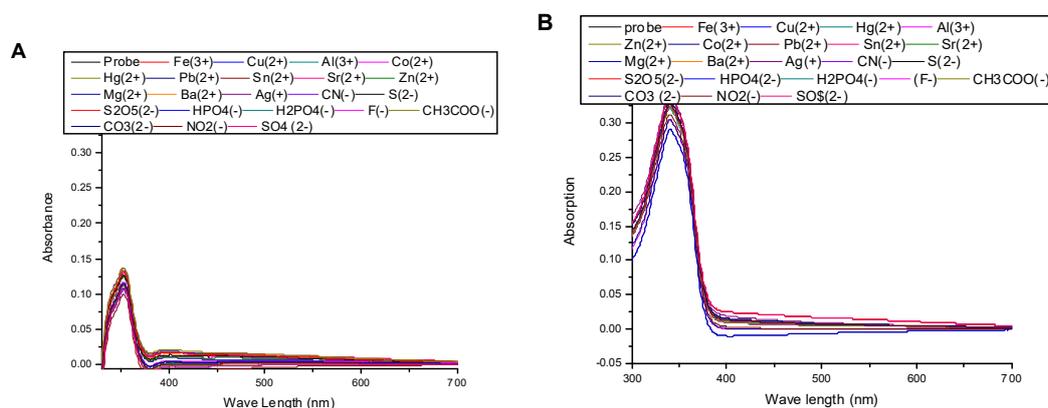
Figure S5. <sup>13</sup>C-NMR spectrum of DSNi



**Figure S6.** FT-IR spectrum of DSNI



**Figure S7.** Absorption of (A) [MSNI] = 10<sup>-5</sup> M and (B) [DSNI] = 5 × 10<sup>-6</sup> M at different solvents



**Figure S8.** Effect of cations and anions on the absorption spectrum of **(A) MSNI** and **(B) D SNI** in water,  $c = 10^{-5}$  M

## Biological activity

### Growth inhibitory activity

The ability of the compounds to inhibit the growth of the model Gram-negative *Pseudomonas aeruginosa* strain was tested in meat-peptone broth (MPB) in the presence of light and dark. The compounds were dissolved in DMSO at a started concentration of 5 mg/mL and further serially diluted in test tubes with meat-peptone broth (MPB) to final concentrations in the range of 25-300  $\mu$ g/ml. The inocula were prepared by diluting the overnight cultures with 0.9% NaCl to a 0.5 McFarland standard. After inoculation with standardized cell suspension, the tubes were incubated at appropriate temperatures in the presence of light and dark for 20 h under shaking. Positive controls (compound and MPB, without inoculum) and negative controls (MPB and inoculum, without compounds) were also prepared. Microbial growth was assessed by the turbidity at 600 nm ( $OD_{600}$ ). The experiments were conducted in triplicate and the averages were taken (standard deviations less than 5%).

### Antimicrobial assay of the treated cotton fabrics

The antibacterial effect of cotton fabrics treated with 0,25% solutions of the compounds was tested in MPB against *P. aeruginosa* under light irradiation and in the dark. Test tubes containing MPB and square shape cotton specimens (10 mm x 10 mm) were inoculated with microbial suspension. Tubes with untreated cotton and without specimens were also prepared as controls. Two sets of tubes were prepared for testing in the presence and absence of light. After 20 h incubation at the appropriate temperature, the specimens were removed and  $OD_{600}$  was determined. The antimicrobial activity of the samples was evaluated by the reduction of bacterial growth in the presence of the treated specimens compared to the untreated. All assays were performed in triplicate and the averages were taken (standard deviations less than 5%).