

1 Session

2 B - Aquatic Toxicology and Ecology

3 Fate and effects of metals: Aquatic biological perspective

4 Poster Presentation

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6 Title: Effect of pH and hardness on the toxicity of zinc, copper, cadmium, and Nickel to
7 the freshwater diatom *Navicula pelliculosa*.

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12 Keywords: Metals, Bioavailability, Aquatic toxicity

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14 Abstract

15 Metal effects on algal growth for species other than green algae have not often been
16 investigated. Also, it has been widely known that metal toxicity is highly depending on
17 water chemistry such as pH, hardness, and dissolved organic matter. Here, we
18 investigated the effect of pH and hardness on the toxicity of zinc, copper, cadmium, and
19 nickel to the freshwater diatom, *Navicula pelliculosa*. The values of pH and hardness of
20 basic medium (modified OECD medium) were 7.0 and 47 mg/L (Ca:Mg ratio is almost
21 1:1 as molar concentration), respectively. The values of pH were varied to 4 different
22 level: 7.0, 7.4, 7.8, and 8.2 (buffered by MOPS). Hardness were varied to 4 different
23 concentration: 47, 77, 107, and 137 mg/L. Each toxicity test was conducted using
24 96-well microplates for 72 h, and the algal growth was monitored using a fluorescence
25 microplate reader. Free ion activities in test solutions were calculated using chemical
26 equilibrium speciation software WHAM6. The values of EC10 and EC50 were
27 determined by concentration-response analysis based on free ion activity. Effects of pH
28 on the toxicity were substantial for copper and not so substantial for zinc, cadmium, and
29 nickel. Effects of hardness on the toxicity were substantial for zinc and nickel and not so
30 substantial for copper and cadmium. The metal bioavailability models were developed
31 using above toxicity data. The model was based on independent effects among pH and
32 hardness according to Deleebeeck et al. (2008, *Sci Tot Environ* 407, 1901). Model
33 parameters were determined using above toxicity data. Comparisons between
34 experimentally obtained and predicted EC50 and EC10 values showed fairly well
35 agreement (almost all errors were within 2-factors).

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