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Nickel doped ZnO nanoparticles decreased dissolution and reduced toxicity in Zebrafish (*Danio rerio*) embryos

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Zinc oxide nanoparticle (ZnO NPs) and nickle (Ni) doped ZnO NPs are found to be applied in various kinds dermatological, biomedical and optoelectronic *fields*. However, available toxicological information is inadequate to assess the potential ecological risk of Ni doped nano-ZnO to aquatic organisms and human. In this study, ZnO NPs and different molar concentrations of Nickle (0–12%) doped ZnO NPs (Ni doped-ZnO NPs) were synthesized and characterized by powder X-ray diffraction, UV–visible diffuse reflectance spectroscopy, field emission scanning electron microscopy (FE-SEM) couple with *energy-dispersive x-ray* (EDX). Moreover, dissolution of Zn^{2+} from ZnO NPs was lowered when increasing the Ni doping. To determine toxicity effect of ZnO NPs and Ni doped-ZnO NPs were investigated using zebrafish embryo and larvae by exposing to different concentrations (1, 5, 10, 15, 20, and 25 mg/L). Furthermore, the toxicity of Ni^{2+} and Zn^{2+} ions, detached from Ni doped-ZnO NPs were investigated to understand the interrelation between ionic Zn^{2+} and Ni^{2+} with the nano-ZnO. The Zn^{2+} content of chorion was measured as 205 ng/ embryo and 152 ng/ embryo in ZnO NPs (5µg/mL) and 12% Ni doped-ZnO NPs (5µg/mL) respectively. The Zn^{2+} content of chorion interferes in embryo hatching without directly affecting viability. Our results clearly showed the reduced toxic effects of Ni doped nano-ZnO than ZnO NPs in zebrafish embryos and larvae suggesting that Ni doping could be applicable method to reduce the toxicity of ZnO NPs.

Keywords: ZnO NPs; Ni doped-ZnO NPs; Zebrafish; toxicity

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