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# The Transport of Coexisting Nanoscale Zinc Oxide Particles, Cu(Ⅱ) and Cr(VI) Ions in Simulated Landfill Leachate

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**Abstract :** As the nanoscale zinc oxide particles (nano-ZnO) accumulate in the landfill, nano-ZnO will enter the landfill leachate and come into contact with the heavy metal ions in leachate, which will change their transport process in the landfill and, furthermore, affect each other's environmental fate and toxicity. In this study, we explored the transport of co-existing nano-ZnO, Cu(II) and Cr(VI) ions by column experiments under different stages of landfill leachate conditions (flow rate, pH, ionic strength, humic acid). The results show that Cu(II) inhibits the transport of nano-ZnO in the quartz sand column by increasing the surface potential of nano-ZnO, and nano-ZnO increases the retention of Cu(II) in the quartz sand column by adsorbing Cu(II) ions. Cr(VI) promotes the transport of nano-ZnO in the quartz sand column by neutralizing the surface potential of the nano-ZnO which reduces electrostatic attraction between nZnO and quartz sand, but the nano-ZnO has no effect on the transport of Cr(VI). The nature of landfill leachates such as flow rate, pH, ionic strength (IS) and humic acid (HA) has a certain effect on the transport of coexisting nano-ZnO and heavy metal ions. For leachate containing Cu(II) and Cr(VI) ions, at the initial stage of landfilling, the pH of leachate is acidic, ionic strength value is high, the humic acid concentration is low, and the transportability of nano-ZnO is weak. As the landfill age increased, the pH value in the leachate gradually increases, when the ions are raised to alkaline, these ions are trending to precipitated or adsorbed to the solid wastes in landfill, which resulting in low IS value of leachate. At the same time, more refractory organic matter gradually increases such as HA, which provides repulsive steric effects, so the nano-ZnO is more likely to migrate. Overall, the Cr(VI) can promote the transport of nano-ZnO more than Cu(II).

**Keywords :** heavy metal ions, landfill leachate, nano-ZnO, transport
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