Title of the Innovation: "A method of recovering copper(II), nickel(II), cobalt(II) and zinc(II) ions from aqueous solutions" Polish patent application no. P.436670 (2021). Polish patent PL 242122 (2023). Patent protection for an invention: 2023.01.16 WUP 03/2023.

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Abstract:

The subject of the invention is a method of recovering copper(II), nickel(II), cobalt(II), and zinc(II) ions from aqueous solutions with pH adjusted to a value above 8 (adding ammonia to the solution) by solvent extraction and polymer sorbents. The essence of the invention is the use of synthesized derivatives of 2,6-bis((benzoyl-R)amino) pyridine (R = H, 4-CH$_3$, 4-N-(CH$_3$)$_2$) as extractants, with a metal: ligand ratio of 1:1, 1:2 and 1:5, respectively and as ion carriers at a metal: ligand ratio of 1: 5. The invention allows to remove from about 13% to 99% of the tested metal ions from aqueous solutions by solvent extraction, and in the case of sorption from about 9% to 88% of the tested metal ions (i.e. Cu, Co, Ni, Zn). The advantages of the invention are low synthesis costs of the obtained compounds (derivatives A1-A3), as well as the possibility of regeneration and reuse of the extractant/polymer sorbent in subsequent processes, and high efficiency of these processes. The invention described in the patent PL 242122 (2023) allows to reduce the costs associated with the discharge of hazardous wastewater and the production of sorption materials (which results from the possibility of their repeated use). Moreover, the organic solvent can also be recycled, which allows for its repeated use in solvent extraction processes and is beneficial for economic and environmental reasons.

Images

A method of recovering copper(II), nickel(II), cobalt(II) and zinc(II) ions from aqueous solutions
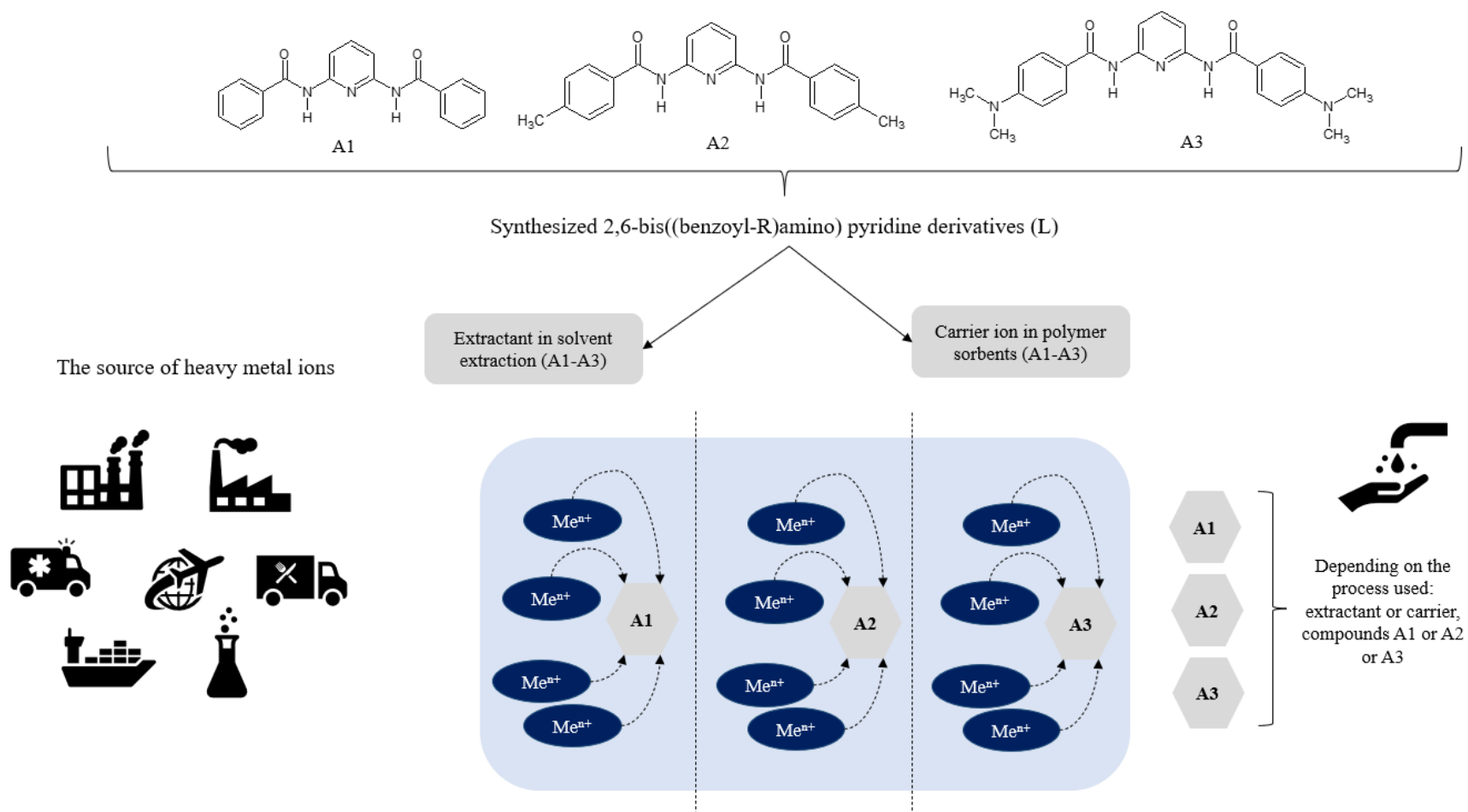

Figure 1. Simplified diagram of the method of recovering copper(II), nickel(II), cobalt(II) and zinc(II) ions from aqueous solutions