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Inorganic polymers of ground waste concrete and industrial waste slags as a low-cost sorbent of heavy metals

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Inorganic polymers (IPs) are alkali activated aluminosilicate materials. Research on the synthesis of alternative cementitious materials such as IPs receives substantial attention not only for their physico-chemical properties that they acquire but for being cost-effective components of the future toolkit of sustainable construction materials (**Provis, 2018; Vavouraki, 2020**). In addition to potential uses of alkali activation materials for the disposal of industrial solid wastes and by-products, there is a great scientific interest in deploying IPs for environmental remediation purposes (**Rasaki et al., 2019**). In particular IPs can possess application value in pollution treatment of immobilization of toxic (and/ or nuclear) wastes, both inorganics and organics (**Ji & Pei, 2019**). Green sustainable aluminosilicate-based adsorbents may facilitate the elimination of toxic metal and organic pollutants from water and/ or wastewater (**Tan et al., 2020**). IPs are considered low-cost sorbents not only for successful recycling of waste materials but also considering added-value materials for the removal of heavy metals from aqueous solutions. However limited number of studies examines waste-slag-based IPs for the removal capacity of heavy metals.

The aim of this study is to synthesize IPs from ground waste concrete and industrial slags and investigate their uptake capacity for heavy metals from aqueous solutions. The calcite-bearing and industrial-slags IPs as sorbent materials were examined for the uptake of solely Cu(II), Zn(II) and, Pb(II) and also or along with competitive aqueous solutions. Kinetics and equilibrium experiments were performed and analytical techniques involving XRF, XRD, FTIR, SEM/ EDS and XPS were used for the characterization and morphology analysis of the produced IPs.

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