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Subject Area	Water treatment
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Study on the modification of polyacrylonitrile fibres for removing zinc from wastewater

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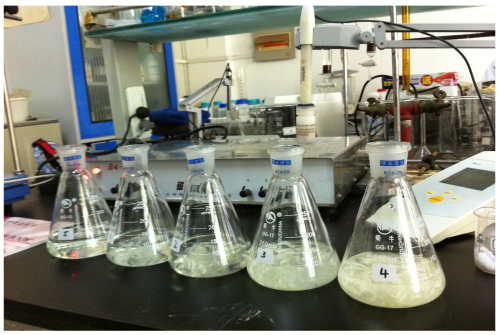

Modification process

Modified PAN fibres

Introduction: Modified polyacrylonitrile (PAN) fibres are used for wastewater treatment for the adsorption of heavy metals. Industrial wastewaters containing zinc (Zn) originate from galvanic industries, battery production, etc. The removal of Zn from wastewater is quite important, since excessive Zn concentrations may be toxic for humans and animals.

Objective: The study describes a modification process of PAN fibres with hydroxylamine hydrochloride ($NH_2OH \times HCl$), so that the PAN fibres would remove Zn from test solutions. The effects of 4 variables on the modification process were studied: pH value, concentration of the modifier $NH_2OH \times HCl$, temperature and reaction time. For each of those factors, the Optimum value was determined by conducting experiments. Photospectrometry was used to determine the ability of the modified PAN fibres for the adsorption of Zn from test solutions. The loading of the adsorbent was described by using the Langmuir and the Freundlich adsorption isotherm models.

Result: By using modified PAN fibres, the adsorption of Zn test solutions was shown to be efficient. The PAN fibres reached a very high adsorption capacity at optimum modification conditions. These conditions were: a pH value of 7, a concentration of $NH_2OH \times HCl$ at 40 g/l, a modification temperature at 80°C and a modification time of 2 hours. Almost the entire amount of Zn dissolved in the test solution was adsorbed by the modified PAN fibres. The chemical kinetics test showed that the adsorption of Zn on the PAN fibres initially increased with time, and eventually levelled off after approximately 8 hours. The adsorption of Zn could be fitted well with the Langmuir and the Freundlich adsorption isotherms, with the Maximum adsorption rate being approximately 20 mg Zn / g PAN fibres.

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