Review of Dissertation

Title: The Use of Nanofiltration for Separation of Heavy Metals from Wastewater
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Heavy metals contained in wastewater have a strong negative influence on the environment. Because of this the processes which remove these metals from wastewater have a great importance. In this dissertation the use of nanofiltration for heavy metals removal from wastewater is studied.
The theoretical part of this study deals with sources and toxicity of heavy metals and the classical methods for their removal from wastewaters. It continues with description of nanofiltration as a perspective process in this field. The methods of characterization of nanofiltration membranes and mathematical modelling of nanofiltration are described in detail.
In the experimental part of this dissertation the experiments with tubular polyamide nanofiltration membranes AFC 30 and AFC 80 are described. Based on the experiments the structural parameters of membranes are determined, such as pore radius or effective fixed charge density. Further, the experiments investigating the efficiency of nanofiltration membranes AFC 30 a AFC 80 for heavy metals (Zn, Co, Ni) removal are described. Zinc sulfate and nitrates of Zn, Co, Ni were used for these experiments. High rejection (> 90%) was achieved for AFC 80 membrane and all salts investigated, while AFC 30 membrane rejection was high for $ZnSO_4$ only.

In my opinion, the extent of the theoretical part is relatively large compared with the experimental part. Some pieces of information are unnecessarily repeated several times. Since English is not my mother language, I cannot quite reliably assess the language level of the text. However, I think that there is relatively high number of basic grammatical errors, e.g. discrepancy of grammatical number of noun and verb in one sentence, incorrect simultaneous use of present and past tense in one sentence etc.

Comments

List of Symbols: Units of permeate volume flux and pure water flux are not correct.

Δx should read membrane thickness.

ΦX should be effective fixed charge density, not charged density.

In accordance with definition on page 72 the variable electrostatic effect is dimensionless.

p. 22: We can read in the text „The specific weight of heavy metal is over 5000 kg m^{-3} *which makes the metal toxic* even at low concentrations.“ Is really the high density of elementary metal the cause of its high toxicity?

p. 52, below eq. (3): "... (k^{-1}) is express as = D/k" is not formally as well as grammatically quite correct. Above that, it is rather needless here.

p. 62, Table 6: In this table the incorrect symbol λi is used in many places. It looks like the product of two variables, while *i* should be subscript.

p. 63: The sentence „Such a fitting parameter will probably produce unrealistic high-volume charges or to a ratio of the volume charge density like that of the salt concentration increasing with concentration (which contradict with common adsorption isotherms).“ is rather incomprehensible. Could it reformulated so that it is clearer?

p. 80, Table 7: Rejections of NaCl and $CaCl_2$ occur twice in the table.

p. 89: Could the author better explain the procedure for r_p, and $\Delta x/A_k$ estimation?

p. 97, Fig. 21: The unit mV of fixed charge density (mV) is not correct.

Despite of the comments mentioned above the goal of dissertation was fulfilled.

I recommend the dissertation for oral defence.

Pardubice, November 10, 2020

doc. Ing. Petr Doleček, CSc.