

Interactive comment on “Clay-biodegradable polymer combination for pollutant removal from water” by M. F. Mohd Amin et al.

Anonymous Referee #1

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Overview: The manuscript described the removal of atrazine by precipitation with 4 different clay-minerals with or without the addition of a cationic starch. Optimization of clay, clay concentration and starch concentration was addressed. In general the study is of interest in the field of water treatment and the specific combination of pollutant, clay and polyelectrolyte may be original but the concept is not very novel. Main comments: The results are sound but the discussion lacks an in-depth mechanistic approach. It is well documented that flocculation has an optimum concentration. For example, upon adding a cationic polymer to a clay suspension flocculation will increase, reach a maximum at a given polymer concentration and then at higher polymer concentrations turbidity may increase due to suspension stabilization. The main mechanism being reducing repulsion between the clay particles, precipitation at minimum repulsion

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and then increasing repulsion due to charge reversal. At charge neutralization maximum precipitation will be reached. Other processes are involved as well. Described in detail in the book "formation and properties of clay-polymer complexes" by Theng. In the introduction the processes of flocculation by polymers should be addressed. Mainly pollutant adsorption to composites of polymer-clay is describe which is relevant but a different mechanism. A hypothesis should be drawn including flocculation processes and most important the discussion should relate to these mechanisms. The different properties of the clays are not clear and therefore the discussion on clay optimization lacks (see details below). Which smectite is "smectite"? Specific Comments: Abstract Should include less of an introduction (2-3 lines and not 7) sentences and more of the results and their rational. Page 178 line 15 – The clay was added to remove atrazine. Although it is not hazardous its addition increases turbidity. So if at the end of the process the turbidity is higher (due to 20-16% clay remaining) the clay removal is not efficient. The smectite was indicated as a magnesium silicate is it hectorite or saponite? Introduction Add references addressing flocculation of clays with polymers. Material and methods Bentonite is a commercial name for a smectite clay. However the clay notified Smectite is very different form the bentonite. Was the smectite also saturated with Na? if not with which cation? Which smectite is it? Since the study is about wastewater it would have been more relevant to perform the experiments in tap water (ant not distilled water) since the ionic strength in wastewater is very high. It is well know that ionic strength highly affects flocculation and therefore the results would be way more relevant with a background of electrolytes in solution. Page 182 – atrazine quantification is not clear. "Measured based on turbidity" or by GC?? Results and discussion Bentonite is a commercial name for a smectite clay. However, the clay notified Smectite is very different form the bentonite. The "smectite" clay must also have exchangeable cations therefore its surface would also be hydrated like the Na-bentonite (page 183 line 20). Perhaps the smectite clay is less hydrophilic but the nature of this clay most be clarified in order to discuss the differences is performance. According to table 2 the CEC of bentonite»smectite contradicting the conclusion that the adsorption

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by bentonite is low due to a high CEC. A discussion explaining the different affinities of atrazine to the different clay-minerals should be added. Page 185 – polymer not introduced in this experiment. Page 185 "from fig 4 it is observed the ATT dosages limit atrazine reduction" perhaps figure 3, in figure 4 the reduction by ATT is 0% for all clay concentrations. Page 185 – line 15-18 very speculative add referece Page 185 line 20 what was the clay concentration? Page 186 line 5-9 explanation addressing flocculation theory

Figure and Tables Table 2 can be deleted and added as a sentence in the text Figure 2 should include concentration between 20-40 mg/L Figures 3-5 same symbols for same cases would help

Please also note the supplement to this comment:

<http://www.drink-water-eng-sci-discuss.net/8/C85/2016/dwesd-8-C85-2016-supplement.pdf>

Interactive comment on Drink. Water Eng. Sci. Discuss., 8, 177, 2015.

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