Int. J. Chem. Sci.: 11(1), 2013, 579-582
ISSN 0972-768X
www.sadgurupublications.com

FLY-ASH ALUM *VS.* INDUSTRIAL ALUM: A COMPARATIVE STUDY OF FLOCCULATION CHARACTERISTICS

DINESH PRAKASH UPADHYAY*

Department of Chemistry, M. S. J. College, BHARATPUR – 321001 (Raj.) INDIA

ABSTRACT

A comparative study of flocculation characteristics of industrial alum and the fly-ash based alum has been performed. The fly-ash based alum can replace the industrial alum. However higher concentration would be required than the industrial alum. Moreover, since the fly-ash alum is more acidic, therefore, more lime dozing is also required to compensate pH decrease.

Key words: Fly-Ash alum, Industrial alum, Lime dozing.

INTRODUCTION

Alum is a flocculating agent. It is used for water purification, to remove suspended particulate. Fly-ash is a bulk waste product of thermal power plants, and its disposal has come up as a big threat. Therefore, considerable research is going on, regarding its utilization. It has been utilized for Ash-Dyke raising, road embankment, construction of bricks/blocks/tiles, reclamation of coal mine and as a soil amender, cement and asbestos production etc.[1-3]

Chemically, fly-ash contains mainly oxides of iron, aluminum, titanium calcium magnesium etc. It contains a substantial amount of aluminum oxide, and successful attempts have been made to extract aluminum as aluminum sulphate or alum. In this communication, we present a comparative study of coagulation characteristics of fly ash alum with the industrial or commercial alum, to check the suitability of this alum, as a coagulant, to replace the industrial alum.

EXPERIMENAL

"Jar test" was conducted, to study the flocculation characteristics and following

*Author for correspondence; E-mail: upadhyay.dinesh1@gmail.com

material were required.

Material

(1) 1 Lit. beaker (2) Conical flask (250 mL) (3) 10 mL graded pipette (4) Magnetic stirrer

Solutions

(1) Stock solution (1000 ppm) Industrial alum

(2) Stock solution (1000 ppm) Fly-Ash alum

(3) Lime solution (1000 ppm)

Apparatus

Jar apparatus, Nephlo-turbidity meter, pH meter,

Procedure

Flocculation characteristic test has been performed by the "Jar test" apparatus. In four beakers, 800mL raw water was taken and placed in the apparatus. All the four samples are stirred at a constant speed (60 rpm) for 5 minutes and 8ml of the lime solution of 1000 ppm is added to each of the samples. These were stirred again for 5 minutes. Then varying volumes of stock industrial and fly-ash alum solutions (1000 ppm) were added to the samples and the stirring is continued for another 10 minutes. Thereafter, all the Jar apparatus stirrers were removed and to allow the formed flocks to settle down the beakers were kept idle. After 20 minutes samples were siphoned carefully from each of the beakers into conical flask and their pH and turbidity were measured.

RESULTS AND DISCUSSION

The results of the study are presented in Table 1. In Fig. 1 and 2, we have presented the variation of turbidity and pH with the varying concentration of both the alums.

Turbidity is an indication of flocculation characteristics; more the turbidity, less the coagulation. It reveals from Table 1 and Fig. 1 that the turbidity, which is indication of the flocculation characteristics (the more the turbidity the less the coagulation may be considered), is decreasing as the alum concentration increases and then it starts increasing, in the both the cases. The turbidity is minimum at 70 and 90 ppm industrial and fly-ash alum

concentrations, respectively. Hence, 70ppm and 90ppm are the optimum concentrations of these two alums. More concentration of fly-ash alum is needed than the industrial alum for optimum flocculation.

It is apparent from Table 1 that the pH decreases first as the concentration of industrial and fly-ash alum increase and then increases. This change in pH with the alum concentration is shown in Fig. 2. The decrease in pH is more in fly-ash alum than the industrial alum. Therefore, more lime dozing would be required.

Table 1: Change of pH and turbidity with concentration of industrial and fly-ash Alums

S. No.	Lime added to 800 mL raw water mL	Alum con. in ppm	pH Alum		Turbidity in NTU Alum	
			Industrial	Fly-Ash	Industrial	Fly-ash
1	0.0	Nil	8.10	8.10	5.2	5.2
2	8.0	50	7.29	7.16	1.1	1.9
3	8.0	70	7.18	7.10	0.74	1.3
4	8.0	90	7.06	7.03	0.76	0.9
5	8.0	110	6.96	6.90	0.8	1.1

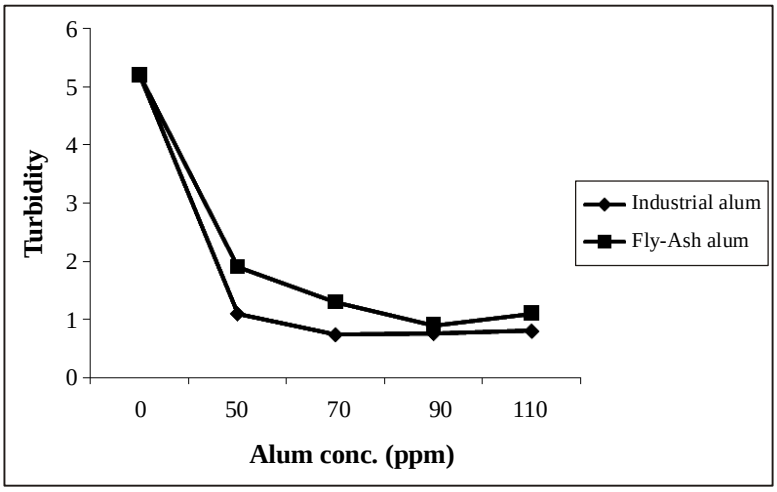

Fig. 1: The variation of turbidity with the alum concentrations

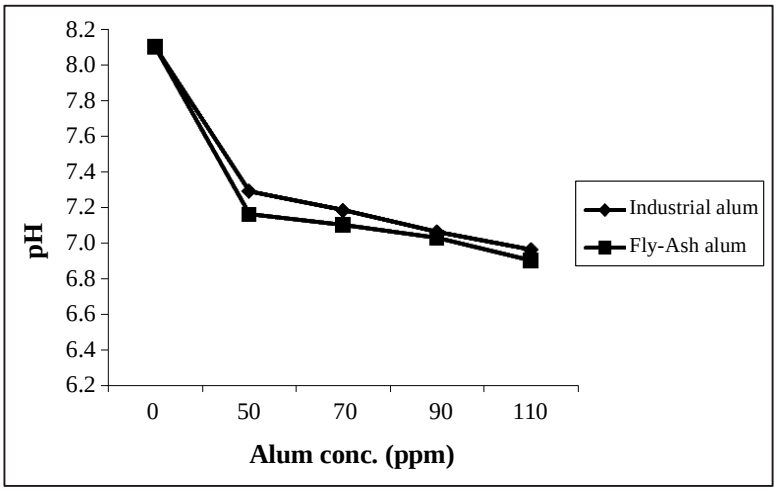

Fig. 2: The variation of pH with the alum concentrations

CONCLUSION

On the base of present study, we conclude that the fly-ash based alum can replace the industrial alum. However, higher concentration of fly-ash alum would be required. Since, fly-ash alum is more acidic than industrial alum, so more lime dozing would also be required to maintain the pH.

REFERENCES

1. R. K. Dhir, Proc. of International Conference on Fly Ash Utilization (2005) pp. O 1.1-1.10.
2. R. C. Joshi, H. M. McMaster and D. M. Duncan, Transport Eng-J. ASCE, **101(4)**, 791-806 (1975).
3. http://en.wikipedia.org/wiki/Fly_ash - Fly Ash Classification and Utilization.

Revised : 02.02.2013 *Accepted : 05.02.2013*