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*NOTE*

# Removal of Fluoride by Using Coconut Shell Charcoal and Paddy Husk Charcoal

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The removal of fluoride by using coconut shell charcoal and paddy husk charcoal is described. The results showed that these adsorbents are effective defluoridating agents but cannot be applied for commercial purposes.

**Key Words: Sodium fluoride, Coconut shell charcoal, Paddy husk charcoal.**

Fluoride content of natural waters can be brought down to safe limit by one of the following methods:

1. By diluting the high fluoride water adding with low fluoride water.
2. By chemical methods of treatment of water such as formation of insoluble compounds containing fluorine or by using ion exchange methods or by adsorption[1, 2, 3–5].

In the present study, adsorption process has been adopted for the removal of fluoride using coconut shell charcoal and paddy husk charcoal.

Each adsorbent such as coconut shell charcoal and paddy husk charcoal was ground into fine powder. The suitable weight of adsorbent was taken in a polythene container and 100 mL of standard sodium fluoride solution was added. To this 1% potassium hydroxide and 2% alum solution were added and shaken well. This mixture was allowed to stand for 24 h and filtered through Whatmann No. 42 filter paper. Then the presence of fluoride content in the filtrate was found out using ion selective electrode[6]. The experiment was repeated by changing the weight of charcoal and alkali to find out the effectiveness of adsorbent.

The experimental values are given in Tables 1 and 2. The values of the experiment show that the fluoride concentration was reduced by both adsorbents but alkalinity of the resultant water increased. Hence, this method cannot be directly used for domestic purpose and is used for academic purpose only.

TABLE-1

DEFLUORIDATION OF DRINKING WATER USING COCONUT SHELL CHARCOAL

Quantity of water: 100 mL Time: 24 h

| S. No. | Amount of adsorbent (g) | KOH (%) | Alum (%) | Fluoride content (ppm) | | pH | |
|---|---|---|---|---|---|---|---|
| | | | | Initial | Final | Initial | Final |
| 1 | 1 | 0.5 | 2 | 2 | 1.53 | 7.8 | 10.1 |
| 2 | 1 | 0.5 | 2 | 3 | 2.43 | 7.8 | 10.1 |
| 3 | 1 | 0.5 | 2 | 4 | 2.81 | 7.8 | 10.1 |
| 4 | 2 | 0.5 | 2 | 2 | 1.39 | 7.8 | 10.1 |

| S. No. | Amount of adsorbent (g) | KOH (%) | Alum (%) | Fluoride content (ppm) | | pH | |
|---|---|---|---|---|---|---|---|
| | | | | Initial | Final | Initial | Final |
| 5 | 2 | 0.5 | 2 | 3 | 2.15 | 7.8 | 10.1 |
| 6 | 2 | 0.5 | 2 | 4 | 2.98 | 7.8 | 10.1 |
| 7 | 3 | 0.5 | 2 | 2 | 1.45 | 7.8 | 10.1 |
| 8 | 3 | 0.5 | 2 | 3 | 2.50 | 7.8 | 10.1 |
| 9 | 3 | 0.5 | 2 | 4 | 3.55 | 7.8 | 10.1 |
| 10 | 4 | 0.5 | 2 | 2 | 1.55 | 7.8 | 10.1 |
| 11 | 4 | 0.5 | 2 | 3 | 2.55 | 7.8 | 10.1 |
| 12 | 5 | 0.5 | 2 | 4 | 3.58 | 7.8 | 10.1 |
| 13 | 5 | 0.5 | 2 | 2 | 1.42 | 7.8 | 10.1 |
| 14 | 5 | 0.5 | 2 | 3 | 2.57 | 7.8 | 10.1 |
| 15 | 5 | 1.0 | 2 | 4 | 3.80 | 7.8 | 10.1 |
| 16 | 1 | 1.0 | 2 | 2 | 1.91 | 7.9 | 12.3 |
| 17 | 1 | 1.0 | 2 | 3 | 2.64 | 7.9 | 12.3 |
| 18 | 1 | 1.0 | 2 | 4 | 3.26 | 7.9 | 12.3 |
| 19 | 2 | 1.0 | 2 | 2 | 1.89 | 7.9 | 12.3 |
| 20 | 2 | 1.0 | 2 | 3 | 2.13 | 7.9 | 12.3 |
| 21 | 2 | 1.0 | 2 | 4 | 3.12 | 7.9 | 12.3 |
| 22 | 3 | 1.0 | 2 | 2 | 1.87 | 7.9 | 12.3 |
| 23 | 3 | 1.0 | 2 | 3 | 2.47 | 7.9 | 12.3 |
| 24 | 3 | 1.0 | 2 | 4 | 3.05 | 7.9 | 12.3 |
| 25 | 4 | 1.0 | 2 | 2 | 1.85 | 7.9 | 12.3 |
| 26 | 4 | 1.0 | 2 | 3 | 2.75 | 7.9 | 12.3 |
| 27 | 4 | 1.0 | 2 | 4 | 3.08 | 7.9 | 12.3 |
| 28 | 5 | 1.0 | 2 | 2 | 1.88 | 7.9 | 12.3 |
| 29 | 5 | 1.0 | 2 | 3 | 2.92 | 7.9 | 12.3 |
| 30 | 5 | 1.0 | 2 | 4 | 3.36 | 7.9 | 12.3 |

TABLE-2
DEFLUORIDATION OF DRINKING WATER USING PADDY HUSK

Quantity of water: 100 mL Time: 24 h

| S. No. | Amount of adsorbent (g) | KOH (%) | Alum (%) | Fluoride content (ppm) | | pH | |
|---|---|---|---|---|---|---|---|
| | | | | Initial | Final | Initial | Final |
| 1 | 1 | 1 | 2 | 2 | 1.73 | 7.5 | 10.3 |
| 2 | 1 | 1 | 2 | 3 | 2.87 | 7.5 | 10.3 |
| 3 | 1 | 1 | 2 | 4 | 3.74 | 7.5 | 10.3 |
| 4 | 2 | 1 | 2 | 2 | 1.25 | 7.5 | 10.3 |
| 5 | 2 | 1 | 2 | 3 | 2.10 | 7.5 | 10.3 |
| 6 | 2 | 1 | 2 | 4 | 3.42 | 7.5 | 10.3 |

| S. No. | Amount of adsorbent (g) | KOH (%) | Alum (%) | Fluoride content (ppm) | | pH | |
|---|---|---|---|---|---|---|---|
| | | | | Initial | Final | Initial | Final |
| 7 | 3 | 1 | 2 | 2 | 1.09 | 7.5 | 10.3 |
| 8 | 3 | 1 | 2 | 3 | 2.58 | 7.5 | 10.3 |
| 9 | 3 | 1 | 2 | 4 | 3.87 | 7.5 | 10.3 |
| 10 | 4 | 1 | 2 | 2 | 1.94 | 7.5 | 10.3 |
| 11 | 4 | 1 | 2 | 3 | 2.75 | 7.5 | 10.3 |
| 12 | 4 | 1 | 2 | 4 | 3.93 | 8.1 | 10.3 |
| 13 | 1 | 0.5 | 2 | 2 | 1.01 | 8.1 | 9.4 |
| 14 | 1 | 0.5 | 2 | 3 | 2.46 | 8.1 | 9.4 |
| 15 | 1 | 0.5 | 2 | 4 | 3.42 | 8.1 | 9.4 |
| 16 | 2 | 0.5 | 2 | 2 | 1.14 | 8.1 | 9.4 |
| 17 | 2 | 0.5 | 2 | 3 | 2.17 | 8.1 | 9.4 |
| 18 | 2 | 0.5 | 2 | 4 | 3.31 | 8.1 | 9.4 |
| 19 | 3 | 0.5 | 2 | 2 | 0.69 | 8.1 | 9.4 |
| 20 | 3 | 0.5 | 2 | 3 | 2.14 | 8.1 | 9.4 |
| 21 | 3 | 0.5 | 2 | 4 | 3.05 | 8.1 | 9.4 |
| 22 | 4 | 0.5 | 2 | 2 | 1.10 | 8.1 | 9.4 |
| 23 | 4 | 0.5 | 2 | 3 | 2.28 | 8.1 | 9.4 |
| 24 | 4 | 0.5 | 2 | 4 | 2.86 | 8.1 | 9.4 |
| 25 | 5 | 0.5 | 2 | 2 | 1.50 | 8.1 | 9.4 |
| 26 | 5 | 0.5 | 2 | 3 | 2.42 | 8.1 | 9.4 |
| 27 | 5 | 0.5 | 2 | 4 | 3.25 | 8.1 | 9.4 |

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