A Model to Predict Dissolved Boron in Penetrating Water Leaving a Fly Ash-Soil Mixture

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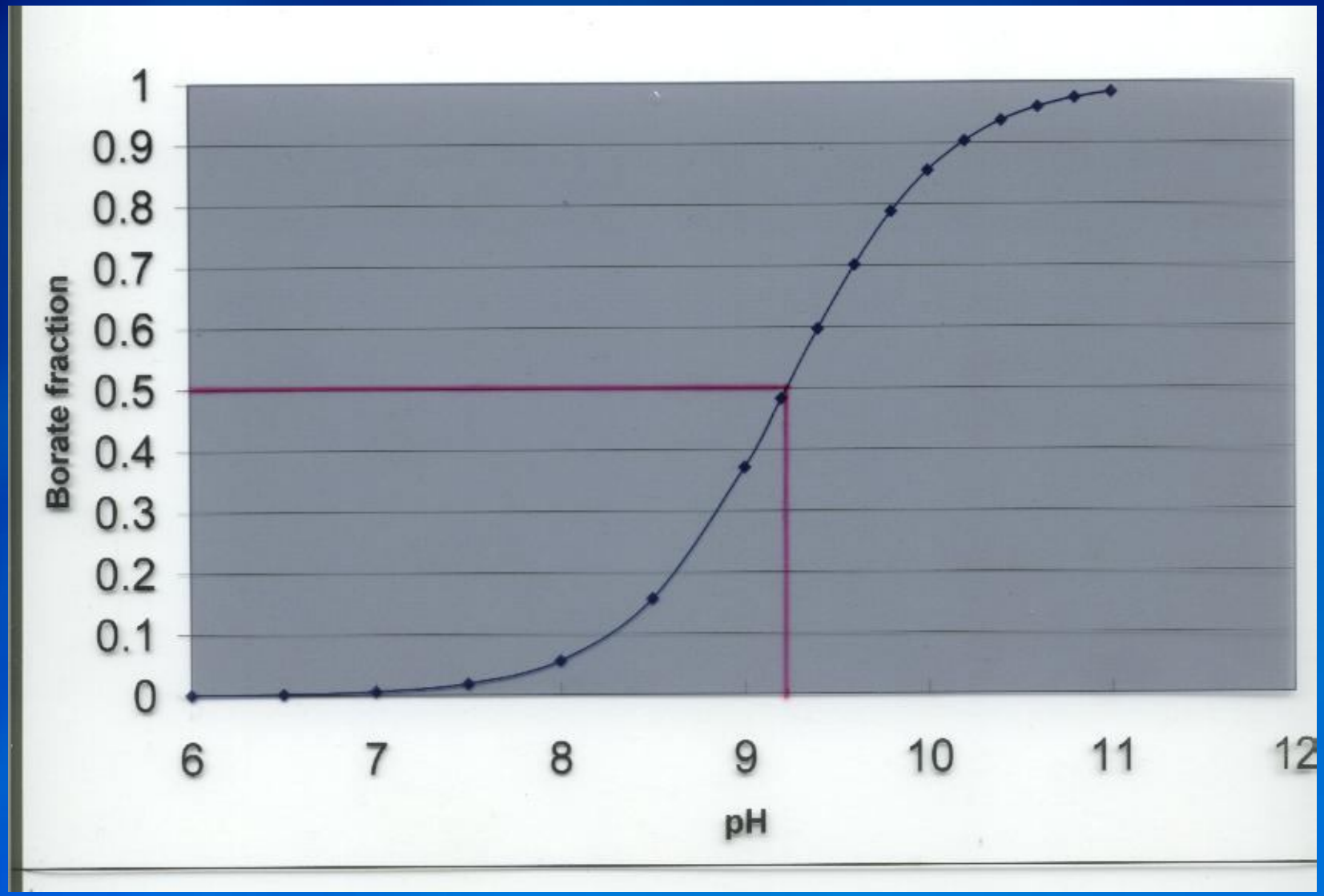
Borate fraction
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
6
7
8
9
10
11
12
pH

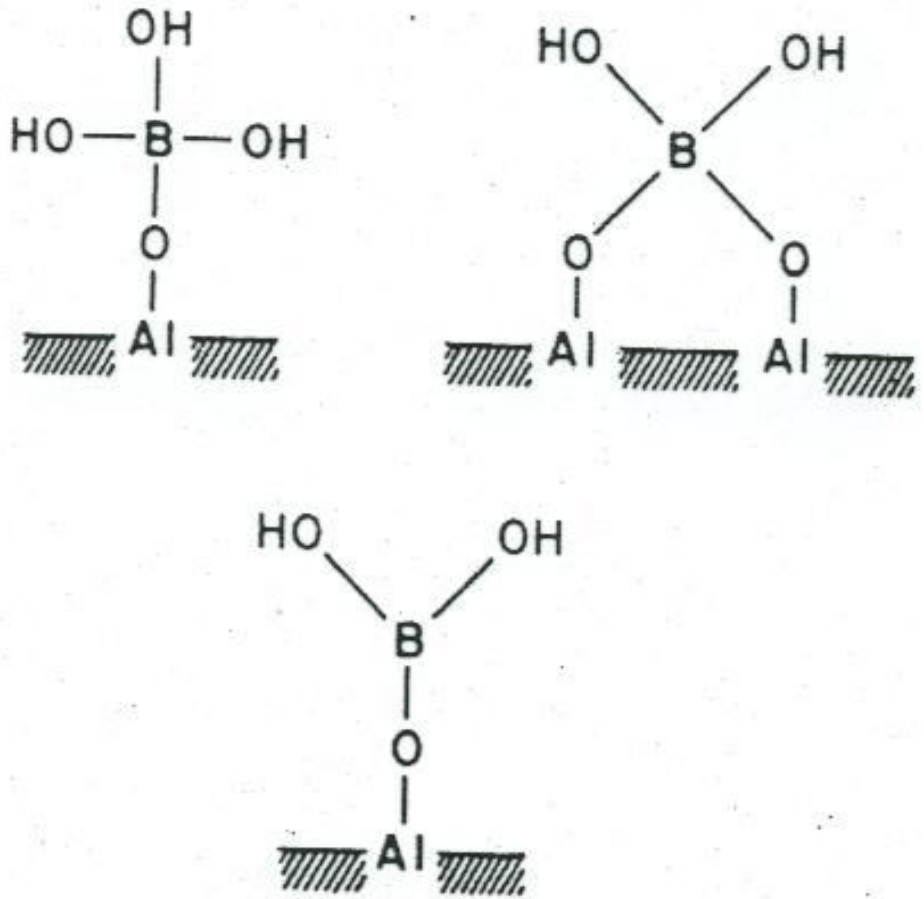

Fig. 1. Possible configurations for B sorbed by surface Al as suggested by Keren and Bingham (1985).

$$Q_B = T\{1 + \frac{PR}{F(Q_T - Q_B)}[1 + K_{OH}(OH)]\}^{-1}$$

$$P = 1 + K_h * 10^{14} * (OH)$$

$$F = K_{HB} + K_B(P - 1)$$

BORON

Mixing of fly ash in soil at a rate of 20% on soil weight basis at an area of a quarter of an acre at 30 cm deep.

The amount of fly ash in the soil:

Q_{FA} = 0.3 m X10^3 m^3 * 1.3 ton m^{-3} * 0.2 = 78 ton

The soil amount in the layer:

M_S = 390 ton - 78 ton = 312 ton

The total amount of boron released to solution from fly ash in the tube

QB = 0.665 mg B / 3.5 g FA = 0.19 mg B/g FA

QB = 17X10^{-6} mol / g FA

The total amount of boron released from fly ash in the soil layer

Q_{BT} = 1.37X10^3 mol / 312X10^6 g = 4.39X10^{-6} mol B/g soil

Q_{BT} =

Adsorbed Boron by soil:

$$Q_B = T\{1 + \frac{PR}{F(Q_T - Q_B}[1 + K_{OH}(OH)]\}^{-1}$$

$$P = 1 + K_h * 10^{14} * (OH)$$

$$F = K_{HB} + K_B(P - 1)$$

T = 6.8 X 10^{-6} mol/g ; R = 0.48 X 10^{-3} L/g

Q_{AB} = 2.98X10^{-6} mol/g = 3.22X10^{-5} g boron / g soil

The amount of adsorbed boron by the soil in the FA layer

3.22X10^{-5} g B / g soil X 312X10^6 g soil = 10.046X10^3 g B

The total amount of leachable boron in the added fly ash

78X10^3 kg FA X 0.665 g B/3.5 kg FA = 14.82X10^3 g B

The leachable boron fraction:

(14.82X10^3 – 10.046X10^3) / 14.82X10^3 = 0.32 (32%)


THANK YOU