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Boron concentration in water samples of Dhi - Qar Governorate (in Iraq) Using Carmine method

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Abstract—**Significant risks for human health may results from exposure to non pathogenic toxic contaminants that are often globally ubiquitous in waters from which drinking water is derived to measure the Boron, $^{10}_{5}B$, concentration in water samples in Dhi-Qar governorate in Iraq. The measurements were performed by analyzing the water samples collected from 45 location using Carmine method.The Boron concentrations which is obtained ranged from 0.25151 ppm in Al-Fhued-al-amaira (1) to 1.05782 ppm in AL-Garma - Center (1) in water samples. The results are presented and compared with other studies. The results could be utilized to make distinctive supplementary contributions when contamination event occurs and to implement water quality standards by concerned authorities to maintain radioactive contamination-free drinking water supplies for the people. The study further reveals that 45 surface water samples have boron below detection limit. The presence of boron in drinking water sources in this territory is of of natural origin. Thus, there is possibility of severe pollution problem with boron in near future.**

Keywords:Boron, Carmine, water samples, Spectrophotometer, Dhi-Qar Governorate.

I. INTRODUCTION

Boron is a nonmetallic element that belongs to Group IIIA of the periodic table and has an oxidation state of +3. It has an atomic number of 5 and atomic weight of 10.81. Boron is actually a mixture of two stable isotopes, ^{10}B(19.8%) and ^{11}B(80.2%)[1].Boron is a naturally occurring element found in rocks, soil and water. The concentration of boron in the earth's crust has been estimated to be <10 ppm, but concentrations as high as 100 ppm can be found in boron-rich areas [2]. It does not appear on the earth in elemental form but is found in combined state as borax, boric acid, tourmaline, colemanite, kernite, ulexite and borates [3-6]. In aqueous solution at pH < 7, it occurs mainly as un-dissociated boric acid (H_3BO_3) but at higher pH boric acid accepts hydroxyl ions from water thus forming a tetrahedral borate anion [7]. Boron deficiency is much more comm- on in crops that are grown in soil that have higher amount of free carbonates, low organic matter, and high pH [8]. Boric acid, borates and per borates can introduced to environment as these have been used in mild antiseptics, cosmetics, pharmaceuticals [9]. Boric acid and borates are used in glass manufacture, soaps and detergents, flame retardants, and neutron absorbers for nuclear installations can cause boron toxicity in environment. Borates have various agricultural uses as fertilizer, insecticide and herbicide because they are not carcinogenic to mammalian and lack of insect resistance compared with organic insecticides [10-11]. Boron occurs as borosilicate in igneous, metamorphic, sedimentary rocks which are resistant to weathering and not readily available to plants. The chemical structure of some boron compounds is found in Figure 1. Elemental boron is insoluble in water [13]. Borax (decahydrate) does not have a boiling point. Borax decomposes at 75°C, and loses $5H_2O$ at 100°C, $9H_2O$ at 150°C, and becomes anhydrous at 320°C. The melting point for anhydrous borax is above 700°C and it decomposes at 1575°C [14]. Boric acid is a weak acid with a 9.2 pK_A and exists primarily as the undissociated acid (H_3BO_3) in aqueous solution at physiological pH [2].

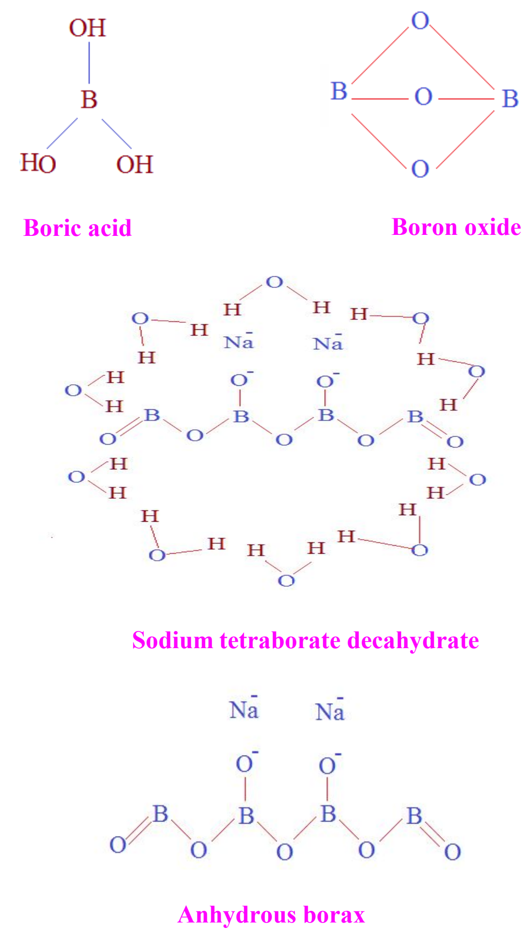

Fig. 1. Chemical Structures of some boron compounds [12]

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