

Measurement of Boron Concentration in Water by Using Track Technique

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Abstract:

A technical method has been used to measure the Boron concentration in water by detecting the α - track density in CN-85 plastic detector. Samples of water are taken from different regions of Basrah city and the results obtained showed that the Boron concentration is approximately larger than 3 PPM and less equal 6 PPM in different places of Basrah city. The high concentration is found in Fao region. That tell us that pollutant in this part of city is larger than the other parts.

Introduction :

Solid state nuclear track detector with excellent resolution and high sensitivity has been applied to experiment^[1-2] in neutron personal dosimetry without any radiators such as fissionable material^[3-5].

In neutron dosimetry the counting of the direct tracks is simple and preferable because the use of fissionable material is unnecessary. The measurements of the direct track is more difficult than that of fission fragments produced by neutron. This difficulty is due to the fact that, the track has been created at various depth and direction, and their depth in general are comparatively short.

Several facilities have made use of polycarbonate in conjunction with fission foil, such as ^{237}Np and ^{232}Th ^[6]. However, gamma rays emitted from the fissionable material in the dosimeter will deliver an undesirable dose to the wearer.

Cellulose nitrate foil is also used to detect fast neutrons by recording the recoil Carbon, Nitrogen, and Oxygen atoms as well as alpha particles of (n, α) reaction^[7]. Water is regarded as the medium that spreads pollutant over a wide area due to its movement, especially when large amount of pollutant is dropped in nature as materials of low radiating activity. However, the α particles emitted from nuclear reaction of ${}^5_1\text{B}^{10}$ with thermal neutrons have sufficient energy to cause chemically etchable damage in an appropriately positioned detector. This is caused by the heavy ionization along their trajectory. Subsequent chemical etching of the detector enlarges the tracks to a size, which is visible with an optical microscope. Boron is an element, which has been extensively, studied using the track technique because the isotope ${}^5_1\text{B}^{10}$ is present in such an abundance that there is less difficulty in pinpointing the nuclear reaction and its large thermal neutron cross section (3838 barn)^[8] for undergoing a (n, α) reaction. Due to current motivation in studying and understanding the cause of pollution in Iraq, we are using the (n, α) reaction to measure the Boron concentration in Basrah water, which is taken from different regions in Basrah city.

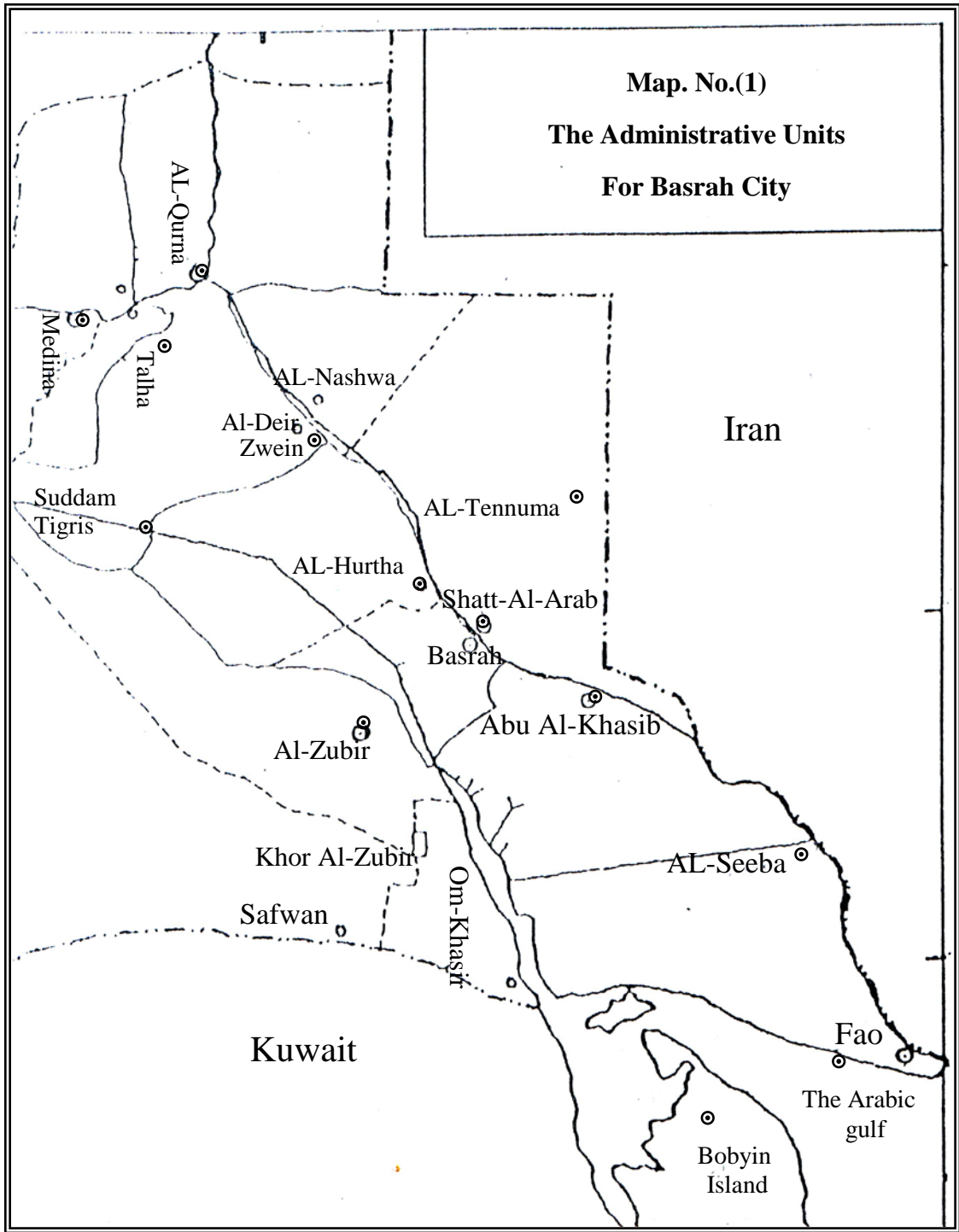


Fig.1. The sample are taken from the places shown on the map of Basrah city.

