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Title: Nondestructive elemental analysis of coins using accelerator-based thermal neutrons

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Source: ARABIAN JOURNAL FOR SCIENCE AND ENGINEERING 32 (1A):43-48 Art No. ISSN 0377-9211 2007

Times Cited: 0

Abstract: The accelerator-based thermal-neutron activation analysis setup at KFUPM has an adequate thermal-neutron flux that can be advantageously used for the elemental analysis of a variety of samples including archaeological ones. The thermal neutrons are derived from the moderation of fast neutrons from the $D(d,n)He-3$ reaction which produces fast 2.5 MeV neutrons. A maximum thermal flux of about 2.5×10^6 n/cm²-s was achieved. For the purpose of determining the suitability of the setup for the analysis of contemporary and ancient coins, we carried out a feasibility study by irradiating a selected number of Saudi Arabian coins dating from 1958 to 1987 in the thermal-neutron flux. The induced gamma-ray activities were then counted using a HP-GMX detector coupled to a PC-based data acquisition and analysis system. The elements that were determined in the coins were copper (around 75 %), nickel (around 25%), and manganese (< 0.5 %). Calibration curves were also established for these elements. The determined concentrations are in agreement with the data published by the Standard Catalogue of World Coins.