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Title: Analysis of phosphate rock samples for vanadium using accelerator-based thermal neutrons

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Abstract: Extensive sedimentary phosphate deposits exist in the Sirhan-Turayf basin in northwestern Saudi Arabia containing significant amounts of uranium, thorium, vanadium and rare earth elements. The determination of the concentration and pattern of distribution of some of these elements is essential for economic aspects. This study reports the analysis of vanadium in selected phosphate rock samples from the basin using accelerator-based thermal neutrons activation analysis (TNAA). Samples were irradiated in a thermal neutron flux of $2.5 \times 10^6 \text{ n-cm}^{-2}\text{s}^{-1}$. The induced activity was measured with a HP-GMX detector coupled to a PC-based data acquisition and analysis system. The facility was calibrated using certified standards of vanadium. The minimum detection limit of vanadium was about 1 mg. Three independent measurements on each sample yielded comparable results indicating the reliability of the technique. The vanadium concentrations in the samples vary from 23 to 457 ppm.