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Concentration of ^{226}Ra, ^{232}Th and ^{40}K radionuclides in natural products commonly used as cosmetics materials

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Natural cosmetics containing plant extracts and minerals are commonly used all over the Arab regions by applying directly to the human skin and hair in order, to clean, improve or change the appearance of them. So, these materials should be safe for health, especially the increasing sale and use of natural cosmetics without available censorship in the presence of dangerous metals or codified instructions. Common natural product samples used as cosmetic materials were collected from various markets in Saudi Arabia, analyzed by using a high purity germanium detector (HPGe) to determine radioactivity concentrations of the natural radionuclides ^{226}Ra, ^{232}Th and ^{40}K and to assess the risk present in these materials to human health. The obtained concentrations for 226Ra and ^{232}Th ranged from 0.65±0.17 to 6.47±1.07 and from 0.34±0.11 to 8.54±1.16 Bq kg^{-1}, respectively, while the concentration of 40K ranged from 10.62±0.35 to 1202.84±15.95 Bq kg^{-1}, with overall mean values of 2.72, 3.73 and 444.09 Bq kg^{-1} respectively. The mean values of radium equivalent, absorbed dose rate and the annual effective dose of the samples under study were determined as 42.25 Bqkg^{-1}, 22.58 nGyh^{-1} and 0.028 mSvy^{-1}, respectively. This work would be useful for establishing baseline data on the gamma background radiation levels in the studied samples for assessment the radiation exposures to the population. It was found that the present results are lower than the permitted limits (UNSEAR2000) and the studied natural samples products are safe to the human usage as cosmetic materials.

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Few-charge systems and multi-quark states

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This study briefly reviews the patterns of the stability or instability of three unit-charge systems (m_1^+, m_2^-, m_3^-) and four unit charge systems and (m_1^+, m_2^+, m_3^-, m_4^-) when the masses are varied, with, in particular, the improved stability of the hydrogen molecule as compared to the positronium molecule. Within quark models inspired by Quantum Chromo Dynamics, there is a close analogy in the limit of heavy quarks where the chromo-electric interaction dominates. Tetraquark states (Q, Q, q, q) are predicted to be stable when the quark-to-antiquark mass ratio M/m becomes very large. Other multi-quark states are formed by coherences in the chromo-magnetic interaction, without analogues in atomic physics. Some recent experimental results on exotics mesons and baryons from SLAC, Fermilab, KEK, CERN, etc., will be presented and commented.

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