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^{222}Rn and ^{220}Rn emanations from powdered samples of samarskite as a function of annealing temperature

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Abstract

Emanation coefficients for radon (^{222}Rn) and thoron (^{220}Rn) were measured from fully metamict samarskite collected from Centennial Cone after 1 h and 24 h annealing in argon from 473 to 1373 K. For the 1 h annealing run, ^{222}Rn emanation coefficients ranged from 5×10^{-6} to 2.1×10^{-5} %, while ^{220}Rn coefficients varied from 6.3×10^{-3} to 2×10^{-2} %. For the 24 h annealing run, ^{222}Rn coefficients ranged from 5.8×10^{-6} to 2.3×10^{-5} %, while ^{220}Rn coefficients varied from 4.1×10^{-3} to 1.5×10^{-2} %. The ^{222}Rn and ^{220}Rn emanation coefficients vs. annealing temperature data can be described by an exponentially decreasing sinusoidal function. Both ^{222}Rn and ^{220}Rn emanation coefficient values after annealing considerably exceeded those measured from an unheated powder reference sample and from the original samarskite sample.

Keywords: Samarskite, radon emanations, thoron emanations, recrystallization, Centennial Cone, ^{222}Rn, ^{220}Rn