Mössbauer-spectroscopic Characterization of the Local Surrounding of Tin Dopant Cations in the Bulk and on the Surface of $YCrO_3$ Crystallites

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^{119}Sn Mössbauer spectra of tin-doped $YCrO_3$, obtained by annealing in air of an $YCr(^{119}Sn^{4+})_{0.003}(OH)_6 \cdot xH_2O$ precursor, provide evidence for the location of Sn^{4+} on the Cr^{3+} site in the bulk of crystallites. Below the Néel point of $YCrO_3$ (T_N = 141 K), Sn^{4+} ions are spin-polarized, the majority exhibiting a hyperfine field H of 80 kOe at 4.2 K. Analysis of the ^{119}Sn spectra of another sample, obtained by impregnation of polycrystalline $YCrO_3$ with a solution of $^{119}SnCl_4$, shows that annealing in H_2 results in the location of the dopant, in the divalent state, on the surface of the crystallites. The parameters of an *in situ* ^{119}Sn spectrum at 295 K (isomer shift δ = 2.76 mm s^{-1} and quadrupole splitting E_Q = 1.95 mm s^{-1}) reveal the presence of Sn^{2+} ions on sites with a coordination number CN < 6. At 100 K these Sn^{2+} ions exhibit no spin polarization. Upon contact with air they are rapidly oxidized to the tetravalent state, as demonstrated by their modified isomer shift value δ = 0.06 mm s^{-1}. For the large majority of both the residual "parent" Sn^{2+} ions and the "daughter" Sn^{4+} ones no spin polarization is observed down to 4.2 K. This means that surface-located tin dopant cations, regardless of their oxidation state, occupy the Y^{3+} sites with an equal number of Cr^{3+} neighbors having mutually opposite spin orientations.

Key words: $YCrO_3$, ^{119}Sn Mössbauer Spectroscopy, Bulk and Surface Sites