\textbf{\textsuperscript{119}Sn Mossbauer spectroscopy of 3d-, 4f- and U- intermetallic compounds}

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The results of Mössbauer spectroscopy (MS) investigation of the magnetic hyperfine fields (HFs) on \textsuperscript{119}Sn probe nuclei for the different groups of the intermetallic compounds based on the 3d-, 4f-elements and uranium are presented in this work. The observed regularities of the spin density formation on the nuclei of nonmagnetic tin atoms reflect the specific features of the magnetic 3d-3d, 4f-4f, 3d-4f, and 5f-5f exchange interactions. It has been shown that the mechanisms of electron polarization on \textsuperscript{119}Sn nuclei are significantly different for the following groups of the compounds.

1. The compounds $\text{TFe}_2$ ($T = \text{Sc, Ti, Y, Zr, Lu, Hf, and U}$) with cubic MgCu$_2$-type and hexagonal MgZn$_2$-type Laves structures are ferromagnetic (F) except for TiFe$_2$ that is an antiferromagnetic (AF). The Fe-Fe magnetic exchange interaction is responsible for magnetic ordering of the $\text{TFe}_2$ compounds. In the F compounds $\text{TFe}_2$, the HFs for \textsuperscript{119}Sn atoms localized on $T$-sites (HF = $B_1$) are positive and proportional to the Fe magnetic moments: $B_1 = A_1 \times \mu_\text{Fe}$, where $A_1 = 28$ T/$\mu$B is the hyperfine coupling constant. The HF $B_1$ reaches the value of about 50 T for \textsuperscript{119}Sn in ZrFe$_2$. The HFs for \textsuperscript{119}Sn atoms localized on Fe-sites (HF = $B_2$) are negative: $B_2 = A_2 \times \mu_\text{Fe}$, where $A_2 = -3.8$ T/$\mu$B.

2. In the ordered and alloys of rare earth metals (R) with p-metals, the HFs for \textsuperscript{119}Sn atoms occur due to 4f-4f indirect interaction and reach the values of 40 T. Systematics of the HFs for \textsuperscript{119}Sn in the F and AF binary Gd - X compounds (X is a p-metal) of different compositions and crystalline structures are presented in this work. The HF values on \textsuperscript{119}Sn nuclei in RA1$_2$ and R Ga FM compounds are formed by the spin and orbital magnetic moments of R-ions.

3. Huge HFs reaching to 56 T have been found for \textsuperscript{119}Sn atoms localized on R-sites of R-3d compounds (3d are Fe, Co and Mn atoms with the localized magnetic moments). This value is the maximum of the known HF values for \textsuperscript{119}Sn atoms in the metallic magnets. It has been shown that the HFs are created due to two additive contributions of R- and 3d-magnetic sublattices. The temperature dependencies of the HFs for \textsuperscript{119}Sn atoms localized on R- and 3d-sites of RFe$_2$, RC$_2$, RC$_6$ compounds are directly related to the temperature changes of 3d-4f and 3d-3d exchange interactions.

4. The selectivity of the magnetic hyperfine interaction for \textsuperscript{119}Sn atoms to the certain 3d-3d or 4f-4f magnetic exchange interactions of the ternary R-based intermetallic compounds has been observed. The HFs on \textsuperscript{119}Sn nuclei localized in Si sites of GdMnSi and GdCoSi ferrimagnetic compounds are induced only by Gd moments. The contributions of Mn and Co magnetic moments to the HF are equal to zero. On the contrary, the HFs for \textsuperscript{119}Sn atoms localized in Ge-positions of RM$_2$Ge$_2$ (R = Ce – Yb) compounds are formed only by the Mn-magnetic moments.

5. The HFs on \textsuperscript{119}Sn nuclei in UTM (T is a d-metal, M is a p-metal) compounds with ZrNiAl-type crystal structure are proportional to the full magnetic moment of U-ions: $B = A \times \mu_\text{U}$, where $A = 6.5(4)$ T/$\mu$B. The HFs are formed by the nearest U-moments and reach of 10 T. The results of \textsuperscript{119}Sn MS study on UPdSn, UCuSn, UAuSn, UNiSn, UCuGe, UGa$_3$, UIn$_3$, UPb$_3$, UGe$_2$, USn$_2$ compounds indicate a strong anisotropy of the magnetic hyperfine interaction and magnetic exchange interaction caused by the significant non-sphericity of 5f-electron shell of uranium ion.

6. Among the 3d-, 4f-, and U-magnetic moments, the ability to create a spin polarization on the \textsuperscript{119}Sn nuclei is the largest for 3d-moments (in equivalent of the unit magnetic moment) and this one is the smallest for the unit spin magnetic moment of R-ions.