

This Week's Citation Classic

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Goldanskii V I. *The Mössbauer effect and its applications in chemistry.*

New York: Consultants Bureau, 1964. 119 p. (This is the authorized translation of *Effekt Mössbauera i ego primeneniya v khimii.*)
(Moscow: Izdatelstvo Akademii Nauk SSSR, 1963. 83 p.)

This monograph describes the physical sense and basic features of the Mössbauer effect, general principles, first results, and promising prospects for its chemical applications—based mostly on my own research. The main task was to create wide interest in the exceptionally vast informativity of chemical Mössbauer spectroscopy. [The *SCI*[®] indicates that this work has been cited in over 275 publications since 1963.]

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"The discovery of the Mössbauer effect in 1958^{1,2} evoked a really striking impression—it became one of the most romantic events of contemporary science. The chemical applications of this discovery turned out to be particularly broad and fruitful. The range of applications explains the interest which was attracted to my book and brought it—as I was glad to learn recently—to the status of a *Citation Classic*.

"Our studies of the Mössbauer effect and its chemical applications were started in 1961 at the Institute of Chemical Physics of the Academy of Sciences of the USSR in Moscow.

"Such main manifestations of hyperfine interactions in Mössbauer spectra as quadrupole splitting, magnetic (Zeeman) splitting, and the particularly peculiar phenomenon of isomer (chemical) shift of spectral lines were already revealed. However, many other interesting subjects still remained to be observed and investigated.

"In our very first experiments, we detected resonance recoilless absorption of γ -rays in polymers, confirming the important part played by optical branches of phonon spectra in the Mössbauer effect. We looked for the contributions of neighbor and more distant chemical bonds in Mössbauer spectra of inorganic compounds, and established the correlation between

the electronegativity of X atoms (or groups) in SnX_4 type compounds and isomer shifts of their spectral lines.³ We were lucky to be able to reveal and explain in 1962 that the asymmetry of quadrupole doublets in the spectra of polycrystalline powders was caused by the anisotropy of motion of Mössbauer atoms in molecules and monocrystals.^{3,4} When my talk on chemical problems was included in the program of the Conference on the Mössbauer Effect held in Dubna, in July 1962, I decided to write the monograph based partly just on the materials of this talk. The writing of the monograph went quite easily because the task really inspired me to disclose to chemists the beauty of the newly discovered effect, the elegance and simplicity of its experimental technique, and the exceptional wealth of information it brings. I also wanted to tell nuclear physicists about the wealth of chemical knowledge which could be acquired by the new method. Editorial delays were much longer then—but still not too long. The book appeared in Russian in the early fall of 1963. Soon afterward its first translation into English was published by the International Atomic Energy Agency (IAEA) in *Atomic Energy Reviews*,⁵ followed by the American edition in paperback with a special author's supplement. This edition was reproduced without any changes by D. Van Nostrand Co., Inc., two years later.⁶

"It was pleasant to realize that the subject of this monograph was of considerable interest to foreign colleagues. In July 1963, I gave an invited talk at the XIX IUPAC Congress in London and in August 1964, I spoke at the Gordon Conference on Inorganic Chemistry.

"By the way, when asked at the conferences about the availability and price of my book, I had to say that the person could either learn Russian and buy it for ca. \$0.40 (32 kopecks) or pay \$12.50 for the American edition.

"Subsequent years brought continuous evidence of the flourishing of Mössbauer chemical spectroscopy.

"Its achievements were before long systematized and surveyed in two comprehensive books^{7,8} which I guess have been cited more often than this first swallow of Mössbauer's spring in chemistry."

1. Mössbauer R L. Kernresonanzfluoreszenz von Gammastrahlung in Ir¹⁹¹. *Z. Physik* 151:124-43, 1958.
2. Kernresonanzabsorption von Gammastrahlung in Ir¹⁹¹. *Naturwissenschaften* 45:538-9, 1958.
3. Goldanskii V I, Gorodetskii G M, Karyagin S V, Korytko L A, Krizhanskii L M, Makarov E F, Suzdalev I P & Khrapov V V. The Mössbauer effect in tin compounds. *Dokl. Akad. Nauk. SSSR* 147:127-30, 1962.
4. Karyagin S V. A possible cause for the doublet component asymmetry in the Mössbauer absorption spectrum of some powdered tin compounds. *Dokl. Akad. Nauk. SSSR* 148:1102-5, 1963.
5. Goldanskii V I. The Mössbauer effect and its applications in chemistry. *At. Energ. Rev.* 1:3-70, 1963.
6. The Mössbauer effect and its applications to chemistry. Princeton: Van Nostrand, 1966. 119 p.
7. Goldanskii V I & Herber R H, eds. *Chemical applications of Mössbauer spectroscopy*. New York: Academic Press, 1968. 701 p.

[The *SCI* indicates that this book has been cited in over 340 publications since 1968.]

8. Greenwood N N & Gibb T C. *Mössbauer spectroscopy*. London: Chapman and Hill, 1971. 660 p.

[The *SCI* indicates that this book has been cited in over 455 publications since 1971.]