Smit J & Wijn H P J. *Ferrites: physical properties of ferrimagnetic oxides in relation to their technical applications.*
Eindhoven, The Netherlands: Philips' Technical Library, 1959. 369 p.
[Philips Research Laboratories, Eindhoven, The Netherlands]

Physical properties of ferrimagnetic oxides in relation to their technical applications were discussed. The theoretical background was provided as necessary for the understanding of the technical characteristics. Both cubic and hexagonal, soft and hard ferrites were treated, up to microwave frequencies. [The *SCI®* indicates that this book has been cited in over 685 publications since 1961.]

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"When Wijn and I wrote this book in the late-1950s, ferrites were at the peak of their technological and scientific development. Since J.L. Snoek, the great discoverer of ferrites, was no longer with us, it was felt appropriate and timely that some of his successors should present his pioneering work and later developments in book form.

"Great progress has been made since in densification of ferrites without increasing their losses. F.G. Brockmann[1] showed that ferrites can live up to our expectations if they are made exactly stochiometric.

"When this book was being prepared, research in garnets was centered on the effects of rare earth elements. Since we did not expect this to be technologically very important, we treated it only summarily. Indeed, mainly YIG and its Al and Ga substitutions have found general use. Garnets seem also to be the only viable materials for bubble memories, being developed during the last 15 years, after bubbles were first observed and analyzed in 1960.[2] Like the earlier Permalloy thin-film memories, it is questionable whether they are going to make it, presumably for similar reasons. Although originally very successful, square-loop ferrites, extensively treated in our book, have left the scene in favor of semiconductors.

"In the book great emphasis was placed on the hexagonal 'ferroxplana' ferrites, which were expected to extend the usable frequency range by a factor of ten. We can say that this dream did not come true completely; the relaxation losses remained too high.

"Shortly before the appearance of our book, the nonlinear properties of ferrites at microwave frequencies were analyzed theoretically, with H. Suhl pioneering the field. Spin waves at half the signal frequency were invoked; unfortunately, lattice perturbations couple too many of these and most applications never got off the ground. For a survey, see a later book[3] which also contains a complete treatment of the preparation of ferrites. Another follow-up is in Wijn's book.[4]

"As in Plato's sequence of government forms, the recognized spin orderings went through a gradual de-alignment process. Thus, after the original rigid ferromagnetic order came Néel's partial antiferromagnetism—for which proposal he was awarded the Nobel prize—followed by canted spin arrangements and later by helical patterns. During the last decade this liberalization found its climax in the popular man-made spin glasses, but according to L.R. Walker,[5] there is nothing new under the sun. Some theorists find the spins frustrated, but this may apply more to themselves; no doubt this field of endeavor will sink into oblivion.

"Why has the book been cited so often? Well, for one thing, it contains a lot of tables and graphs, but it gave us more satisfaction when occasionally some of our more personal contributions were quoted. To present these in integrated form was actually the fun of writing the book."

1. **Brockmann F G.** Nickel-zinc ferrites. *J. Amer. Ceram. Soc.* 55:28-31, 1972.
2. **Kooy C & Enz U.** Domain structure of $BaFe_{12}O_{19}$. *Philips Res. Rep.* 15:7-30, 1960.
3. **Smit J**, ed. *Magnetic properties of materials.* New York: McGraw-Hill, 1971. 344 p.
4. **Wijn H P J & Dullenkopf P.** *Werkstoffe der Elektrotechnik.* New York: Springer-Verlag, 1967. 148 p.
5. **Walker L R & Walstedt R E.** Computer model of spin glasses. *Phys. Rev. Lett.* 38:514-18, 1977.