The entropy of *N*-dimethylaminodiborane at 271.60°K was calculated for this modified assignment using Mann's values of moments of inertia, etc. The entropy of translation, rotation, and free internal rotation is 75.66 erg-deg^{-1}-mole^{-1}. The total entropy determined calorimetrically by Furukawa *et al.*[4] is 72.25±0.14 erg-deg^{-1}-mole^{-1}. A barrier to internal rotation of 3.7 kcal/mole is necessary for agreement. A methyl torsional oscillator with a sinusoidal potential of amplitude 3.7 kcal/mole has a fundamental frequency of about 250 cm^{-1}, in support of the assignment of 260 and 236 cm^{-1} to methyl torsion oscillations.

TABLE I. Infrared spectrum of *N*-dimethylaminodiborane (KBr prism: 635–596 cm^{-1}, CsBr prism: 432–261 cm^{-1}).

Frequency (cm^{-1})	Assignment
635 w	$236+396=632$ (A_1)
616 w	$236+379=615$ (B_2)
611 w	$1011-396=615$ (A_1)[a]
596 w	$269+325=594$ (B_2)
432 m	$\nu_{41}(b_2)R$
427 m	$\nu_{41}(b_2)Q$
424 m	$\nu_{41}(b_2)Q$
416 m	$\nu_{41}(b_2)P$
396 W	$\nu_{13}(a_1)$
379 w	$\nu_{42}(b_2)$
269 w	$\nu_{30}(b_1)$
261 w	$\nu_{31}(b_1)$; $\nu_{30}-\nu_i+\nu_i$

[a] $1011+396=1407$ (A_1) has been observed at 1414 cm^{-1} in the NaCl prism spectrum.

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Effect of V_2O_5 on Nickel-Zinc Ferrite Formation

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IT is well known that certain minor components greatly alter the rate of a solid state reaction. We have found that the addition of V_2O_5 has such an effect upon ferrite formation from a mixture of NiO, ZnO, and Fe_2O_3. For a fixed firing time the vanadium acts to decrease the necessary firing temperature.

Similar effects have been sought unsuccessfully (at least in degree) using Li_2CO_3, KCl, BeO, $FeCl_2$, B_2O_3, As_2O_3, Sb_2O_3, P_2O_5, $K_2Cr_2O_7$, CrO_3, and MoO_3.

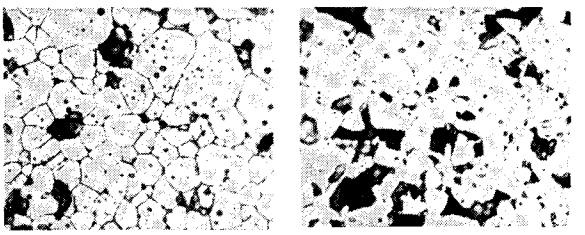
The measured temperature decrease is dependent upon the percent of V_2O_5 added and the characterizing criteria. 0.75 mole percent V_2O_5 decreases this temperature as much as 400°C for $Ni_{0.4}Zn_{0.6}Fe_2O_4$.

The following data were taken on material fired four hours. The average size of the oxide particles used were[1]

Fe_2O_3	0.26 micron
NiO	0.64 micron
ZnO	0.58 micron.

The Fe_2O_3 was a calcinated ferric sulfate.

We consider five methods of determining reaction completeness. (1) *Color*. Ferrites not containing vanadium shade gradually from a red at 1000°C to a bluish at around 1200°. Those containing the vanadium went suddenly from red to a dark black between 800 and 850°. (2) *Grain Size*. The mean grain size of the cores containing vanadium and fired at 950° is approximately the same as that for cores without vanadium fired at 1350° (see Fig. 1). (3) *Density*.



(a) (b)

FIG. 1. Comparative photomicrographs of a Ni-Zn ferrite fired at 1350°C and a Ni-Zn ferrite containing V_2O_5 fired at 950°C. (a) Specimen A-112 (250×). Plain Ni-Zn ferrite core, fired for four hours at 1350°C. (b) Specimen B-2018–1 (250×). Nickel-zinc ferrite core containing V_2O_5 and fired for four hours at 950°C.

The density of the material not containing vanadium went from slightly greater than the green density at 1050° to about 0.95 the x-ray density when fired at 1250°. The material containing vanadium had a density very nearly equal to the green density but slightly less at 800°, and were approximately 0.95 of the x-ray density when fired at 950°C. (4) X-ray diffraction photographs of the material fired at 850°C containing V_2O_5 showed sharp lines in the back reflection region. To obtain the same line sharpness, the material not containing vanadium must be fired at a temperature several hundred degrees higher. (5) *Magnetic Properties*. Figure 2 shows comparative measurements of the permeability and *Q* or inverse loss tangent, for a vanadium containing material and for material not containing vanadium.

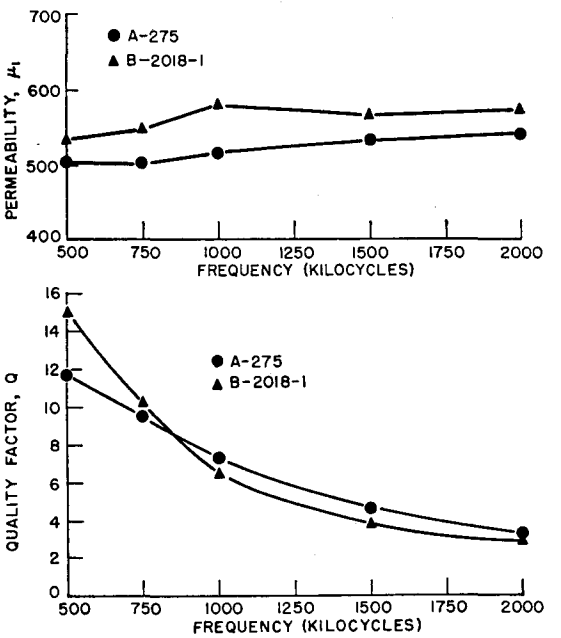


FIG. 2. Comparative measurements of μ and *Q vs* frequency for cores A-275 and B-2018–1. A-275 Ni-Zn ferrite core fired at 1250°C for four hours. B-2018–1 Ni-Zn ferrite core containing vanadium, fired at 950°C for four hours.

A more thorough study of this phenomenon is being made.

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[1] These data were obtained by the Carboloy Corporation, Detroit, using an electron microscope.