value for $\Delta\nu_P$, we obtain

$$\delta = (182 \pm 22) \text{ ppm.} \quad (5)$$

The anomaly δ presumably arises from the effects of nuclear structure, nuclear interaction currents, and the unevaluated higher order radiative corrections. Sessler and Foley[14] have estimated the structure and interaction current effects. Their results depend on the choice of the nuclear wave function and on the form assumed for the interaction currents. Using the Pease-Feshbach nuclear wave function, they find a structure contribution to δ of 138 ppm. They have also considered two forms for the interaction current. The first contributes 2.0 ppm to the anomaly (δ) and the second 230 ppm. As in the case of tritium,[14] the present results definitely exclude the second type of interaction current.

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$$\Delta\nu_P(\text{He}^{3+}, 2S) = 1083.559 \text{ Mc/sec.}$$

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Effect of Temperature on the Spectral Distribution of Blue Emission Bands of ZnS:I and ZnS:Cu:I Phosphors

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IT is known that blue photoluminescence can be obtained from ZnS phosphors prepared with halide (X), as well as from ZnS phosphors prepared with high (0.1%) proportions of Cu, together with X. Some investigators[1–3] have felt that the blue emission from ZnS:Cu:X is due to the formation of new types of Cu centers, while others[4,5] have believed this blue emission to be identical in origin with the blue band found in ZnS:X, which is tentatively associated with vacancies or vacancy-halide complexes.

As part of a research program on the nature of activator centers in ZnS-type phosphors, the blue emission bands were investigated with the thought that emissions arising from centers consisting of vacancies or of associated vacancies and halide would have different temperature characteristics from emissions associated with Cu. As a result, our investigations show that the blue emission bands from phosphors prepared with and without Cu can be differentiated by the effect of temperature on the spectral distribution of the emission bands.

Figure 1 shows the spectral distribution of the emission from ZnS:I and from ZnS:Cu:I, at 300°K and at 77°K, using 3650 A excitation. The blue emission from phosphors prepared with Cu has a large *negative* temperature coefficient of the peak emission energy,

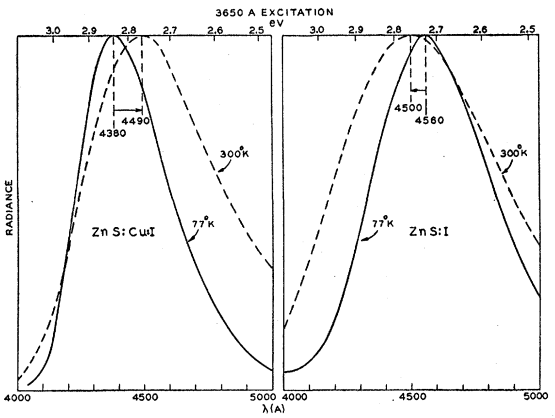

FIG. 1. Spectral distribution curves of the emission from ZnS:I and ZnS:Cu:I phosphors, at 300°K and at 77°K, using 3650 A excitation.

while the blue emission band from phosphors prepared without Cu has a small *positive* temperature coefficient of the peak emission energy. Similar results are also found when 3125 A photons are used for excitation.

The blue emission band from ZnS:Cu:I, therefore, should not be considered as being identical with the centers which give rise to the blue emission from ZnS:I. The utility of the temperature dependence of the spectral distribution of emission bands is further demonstrated by the finding that ZnS:Ag:X phosphors, like their Cu counterparts, also have negative temperature coefficients of the peak emission energy. In this fashion, emissions arising from vacancies (or from associated vacancy-halide complexes) can be differentiated from emissions arising from the presence of metallic activators.

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