Soortelijke warmte en inwendig stark-effect bij verbindingen van zeldzame aardmetalen.
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SUMMARY.

An investigation has been made as well of the mean specific heats of: BaO, La₂O₃, CeO₂, Nd₂O₃, Dy₂O₃, Er₂O₃, YbO and HfO₂ + 3% ZrO₂, as of the mean and true specific heats of: BaSO₄, La₂(SO₄)₃, Ce₂(SO₄)₃, Nd₂(SO₄)₃, Sm₂(SO₄)₃, Gd₂(SO₄)₃, Dy₂(SO₄)₃, Er₂(SO₄)₃, and Yb₂(SO₄)₃.

The oxides were found to show many irregularities of their cₚ-t-curves, which are due to the presence of transition-points, as well as to retardation-phenomena.

In some temperature-intervals only irreproducible values for the mean specific heats of some of the substances could be found. These phenomena are dealt with in a separate chapter.

As well the sesquioxides of the rare earth-metals, as CeO₂ and YbO, all appear to show two separate curves for the mean specific heats in the temperature-range beneath 300° C., probably owing to the simultaneous occurrence of a transition-point and of retardation-effects in this temperature-interval. As no effects of this kind occur with BaO and HfO₂, — the oxides of the elements immediately preceding and following the group of the rare earth metals, — this phenomenon obviously must be considered to be characteristic for the oxides of the rare earth metals and to be independent of the number of O-atoms present in them.

In some cases a similarity proved to be present between the behaviour of the rare earth metals themselves, as investigated by Jaeger, Rosenbohm and Botema, and of that of the corresponding oxides. This fact makes it questionable whether the complications, occurring with these metals, must be considered as being characteristic for the metallic state only of the said elements.

With one single exception: La-sulphate at 390° C., — the investigated sulphates of the first subgroup of the rare earths (La-, Ce-, Nd- and Sm-sulphate) showed no transition-points or other irregularities in their cₚ-t-curves.

Those of the second subgroup (Gd-, Dy-, Er- and Yb-sulphate), however, showed as well transition-points as retardation-effects.
The $c_p$-curves of $Gd$- and $Yb$-sulphate and those of $Dy$- and $Er$-sulphate showed a resemblance in several respects.

From partly theoretical, partly spectroscopical data, an estimation has been made of the size of the anomalies of the mean specific heats of the sulphates mentioned above, due to the splitting of the energy-levels of the basic states of the ions, brought about by the internal electrical fields of their sulphate-crystals.

The anomalies thus calculated, in general proved to be in good accordance with the values, derived from the observed mean specific heats, as obtained by means of the calorimetric method.

An exception appears to occur in the case of $Sm$-sulphate, where not only the energy-level caused by the internal Stark-effect needed to be taken into account, but also one involved by the presence of the two $j$-values $5/2$ and $7/2$. If this latter level be disregarded, or its value be esteemed some 3 times higher than predicted by theoretical speculations, the congruity can, however, be re-established.

The values for the energy-levels of $Nd \cdots$, as computed by Penney and Schlapp from Gorter's magnetical measurements, gave a much better agreement between the calculated and observed values than those resulting from the spectroscopical investigations.

The true specific heat of some of the sulphates, especially at the higher temperatures, could not be calculated from the $Q$-curves with sufficient accuracy by means of the usual formulae with 3 constants.

The curvature of the curves, however, proved to be in good accordance with the magnitude of the anomalies. Only in the case of $Gd$-sulphate, the shape of the $c_p$-curve showed a complete deviation in character from the predicted one; this fact is probably caused by the occurrence of transition-point at 340° C.