

## Preliminary communication

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### Formation of methyl- and ethylgallium halides by the direct reaction between the metal and alkyl halide

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The syntheses of Group III organometallic compounds by the direct reaction between the metal and alkyl halide, have now been described for all of the metals<sup>1</sup> apart from gallium. We have recently shown<sup>2</sup> that indium metal readily reacts with the lower alkyl halides:



R = Me, Et, n-pr; X = Br, I.

The ease with which these reactions occurred at room temperature prompted the present investigation.

Finely divided gallium metal was shaken with excess RX (R = Me, Et; X = Br, I) in vacuo at room temperature. The reactions with the iodides, which were carried out in the absence of light to prevent photo-decomposition, were complete in two weeks and analysed as  $\text{R}_3\text{Ga}_2\text{I}_3$ . For R = Me a white crystalline product (m.p. 36–37°) was obtained and for R = Et a colourless liquid, which partially crystallised on standing.

Bromide reactions were much slower and required four weeks to produce significant amounts of products  $\text{R}_3\text{Ga}_2\text{Br}_3$ , which were colourless liquids. The vibrational spectra of the products in the gallium–carbon region (Table 1) are of the form expected for compounds which contain  $\text{R}_2\text{Ga}$  and R–Ga groups as illustrated by the following examples:  $(\text{Me}_2\text{GaCl})_2$ , 604,545  $\text{cm}^{-1}$ <sup>3</sup>;  $(\text{MeGaBr}_2)_2$ , 595,591  $\text{cm}^{-1}$ <sup>5</sup>;  $(\text{Et}_2\text{GaCl})_2$ , 580,520  $\text{cm}^{-1}$ <sup>4</sup>;  $(\text{EtGaCl}_2)_2$ , 568,570  $\text{cm}^{-1}$ <sup>4</sup>.

These results suggest that the following reactions occur:



They are analogous to those already reported for aluminium and indium.

The direct reaction is unlikely to be useful as a method for synthesising higher alkylgalliums, since previous work<sup>5</sup> has shown that these compounds are decomposed by alkyl halide.

TABLE 1

## GALLIUM-CARBON STRETCHING VIBRATIONS IN THE REACTION PRODUCTS

<i>Reaction product</i>	$\nu$ (Ga-C) ( $\text{cm}^{-1}$ )	
	<i>Raman</i>	<i>IR</i>
$\text{Me}_3\text{Ga}_2\text{Br}_3$	620w	622s
	593s	581s
	548s	542s
$\text{Et}_3\text{Ga}_2\text{Br}_3$		580s
		551s
		509s
$\text{Me}_3\text{Ga}_2\text{I}_3$	616w	608s
	576m	574s
	536s	540s
$\text{Et}_3\text{Ga}_2\text{I}_3$	580w	573s
	551s	545s
	510s	506s

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