

DTA/TG, XRD and ^{27}Al MAS NMR of yttrium aluminium garnet, $\text{Y}_3\text{Al}_5\text{O}_{12}$ by sol-gel synthesis

ABSTRACT

^{27}Al magic angle spinning (MAS) NMR has been used at two fields (8.45 T and 14.1 T) to follow the optimisation of a sol-gel process to produce yttrium aluminium garnet, $\text{Y}_3\text{Al}_5\text{O}_{12}$ (YAG), at moderate temperatures. ^{27}Al MAS NMR is shown to be a highly sensitive tool to determine the presence of the impurity phase, yttrium aluminium perovskite, YAlO_3 . Single phase, polycrystalline YAG has been successfully synthesized, using this modified sol-gel process, at temperatures as low as 800 C. Chemical shifts, quadrupolar coupling constants and asymmetry parameters are reported for the tetrahedral and octahedral aluminium sites of YAG.

Keyword: ^{27}Al MAS NMR; DTA/TG; Sol-gel; XRD; YAG ($\text{Y}_3\text{Al}_5\text{O}_{12}$); YAP (YAlO_3)