DTA/TG, XRD and 27Al MAS NMR of yttrium aluminium garnet, Y3al5o12 by sol-gel synthesis

ABSTRACT

27Al 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, Y3Al5O12 (YAG), at moderate temperatures. 27Al MAS NMR is shown to be a highly sensitive tool to determine the presence of the impurity phase, yttrium aluminium perovskite, YAlO3. Single phase, polycrystalline YAG has been successfully synthesized, using this modified sol-gel process, at temperatures as low as 800ŬC. Chemical shifts, quadrupolar coupling constants and asymmetry parameters are reported for the tetrahedral and octahedral aluminium sites of YAG.

Keyword: 27Al MAS NMR; DTA/TG; Sol-gel; XRD; YAG (Y3Al5O12); YAP (YAlO3)