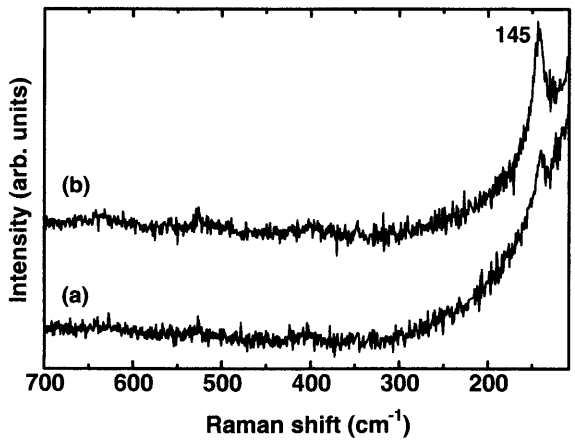

Fig. 6. Raman spectra of spin-coated titanium oxide films heat-treated at 300°C (a) before and (b) after VUV irradiation.

incorporation of the active oxygen species to the films brings about the decrease in the density of defects,[20,21,31] and accelerates crystallization during the heat treatment. The films prepared using the VUV irradiation are expected to have a lower defect density than the films which were only heat-treated. This may have brought about the increase in the hardness of the films, and the decrease in the leakage current density in I–V characteristics.

4. Conclusions

The preparation of titanium oxide thin films by the sol–gel technique using 172 nm VUV irradiation with an excimer lamp was investigated. VUV irradiation causes the removal of hydroxyl and organic functional groups from the transparent coating film without causing the reduction of titanium. Then the film begins to transform into an oxide from a hydroxide. It was found that the VUV irradiation before the heat treatment promotes the formation of the Ti–O networks and crystallization at comparatively lower temperatures in subsequent heat treatment as compared with that under the nonirradiation condition. These results suggest that the photoirradiation sol–gel process is promising for preparing titanium oxide films on the thermolabile substrates used in optical and electronic applications. It is conceivable that this technique is applicable to the preparation of other metal oxides.

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