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Effects of sintering temperature on chromium doping in TiO2

The effects of sintering temperature on the electrical conduction properties of Cr-doped polycrystalline TiO_2 powder were investigated. Rutile TiO_2 was doped by using the method of high temperature diffusion.Cr_2O_3 powder (6% by weight) was used as the dopant precursor. Different samples were prepared by varying the sintering temperature from 400C^o to 1100 C^o .

The variation of electrical conductivity of each sample, compressed pellets with copper electrodes, with the temperature was studied in the temperature range from 150 C^o to 350 C^o . Samples prepared at each sintering temperature showed Arrhenius type

temperature dependence. The conductivity was insensitive to sintering temperature and was in the same order as undoped TiO_2 .At intermediate temperatures (400-900 C^o) the variation was more significant. At high sintering temperatures (>900 C^o) the variation was more significant. At high sintering temperatures (>900 C^o) the conductivity was fairly insensitive to sintering temperature.

The activation energy decreases significantly (60%) when the sintering temperature increases. At high temperatures(>900 C^o) the activation energy was independent of sintering temperature. We conclude that the highest donductivity and the lowest activation energy, and hence the highest Fermi energy, can be obtained by sintering the sample at 900 C^o for five hours.