Solid state reaction method was selected to prepare Sr$_2$Bi$_2$O$_5$ powders. The sample was characterized by X-ray diffractometer (XRD) and scanning electron microscope (SEM). Then the photocatalytic activity of Sr$_2$Bi$_2$O$_5$ was evaluated by photodegradation of acid red G under fluorescent ($\lambda = 365$ nm) irradiation. The Sr$_2$Bi$_2$O$_5$ sample obtained at 900°C presented high photocatalytic activity. The photocatalytic degradation rate of acid red G (50 mg/L) by the catalyst (3.0 g/L) was 98%. The UV–visible absorption spectral analysis showed that the photocatalytic degradation effectively destroyed the color groups and the aromatic groups of acid G completely. The photodegradation reactions at different initial concentrations followed the first order kinetics.

**Keywords:** Sr$_2$Bi$_2$O$_5$; Solid state reaction method; Photocatalyst; Acid Red G