Through a combination of X-ray diffraction, electrical transport, magnetic susceptibility and heat capacity measurements, we report the effect of La doping on Sr in the newly discovered SrFBiS2 system. Superconducting transition with critical temperature $T_c$ of 2.8 K, developed from a semiconducting-like normal state, was found in Sr0.5La0.5FBiS2. A strong diamagnetic signal and a clear specific heat anomaly associated with this transition were observed, confirming bulk superconductivity. The upper critical field $H_{c2}(0)$ was estimated to be 1 Tesla by using the Ginzburg-Landau approach. Our experiments therefore demonstrate that bulk superconductivity can be achieved by electron doping in the SrFBiS2 system.

**Keywords:** BiS2-based superconductor; Hall effect; Specific Heat.