available lumen depreciation data combined with exponential decay model by the nonlinear fitting method as shown in Fig.1 The second step is to use the fitted value under different temperatures and the Arrhenius equation with a fitting method. There are two options for nonlinear fitting, as described in the Fig.2, in the second step. According to LM-80 and TM-21, the temperature used in the Arrhenius equation is soldering temperature. Here during the Ea fitting, the temperature used is also the soldering temperature for both LED light sources and LED luminaires.

While for the Ea fitting of LED light sources, the lumen depreciation data are from the available LM-80 database. For the Ea fitting of LED luminaires, lumen depreciation data from 4 brand luminaires were tested by authors. The soldering temperature is obtained through thermal couple during normal operating conditions. Luminaires tested are shown in Fig.3. Two down lights, one spot light (Par light) and one retrofit bulb are used.
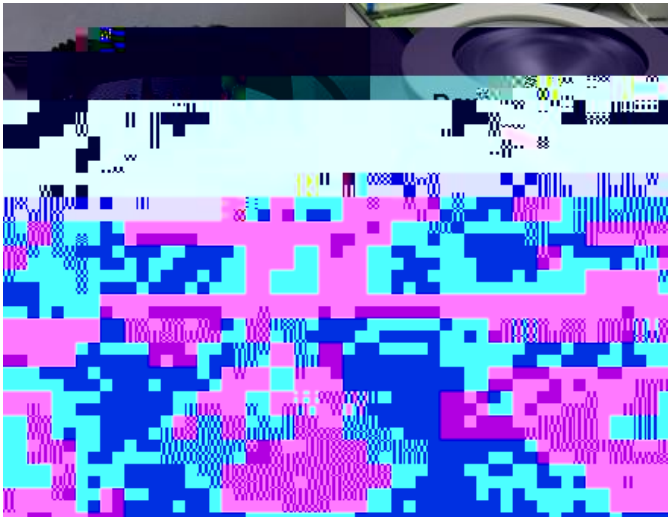

Fig.3 Pictures of Luminaires

Experiments