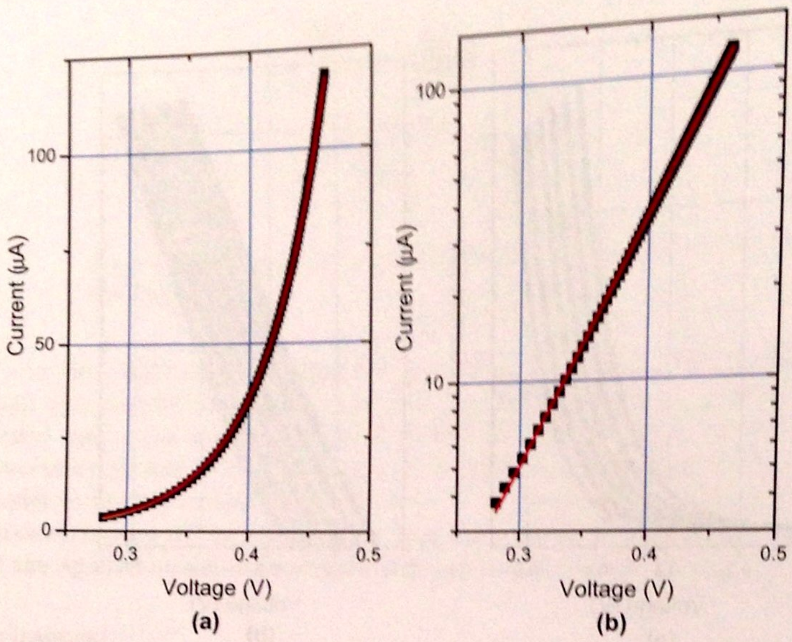

Figure 4. Exponential fit of data corresponding to the temperature T= 47.8 ± 0.2 °C in linear scale (a) and semi-logarithmic scale (b). Normalized χ^2 is of the order of unity for uncertainties of the current of the order of 0.05 μA which is three times larger than the instrumental resolution and can be attributed to the experimental variability.

exponential dependence of I on V. A first analysis of data can be done by using eq. (1), limiting the measurements to the region of moderate injection current where I is dominated by diffusion. Consequently, we can neglect non-linear effects on the current, reducing the number of parameters to the two appearing in eq. (1). We write the eq. (1) in the more compact form:

$$I = A\left[\exp\left(BV\right) - 1\right]$$

where $B = e/nkT$. Fig. 4a shows a non linear fit of this equation, through a standard least square routine[16], which gives a value of $B = e/nkT = 19.48 \pm 0.03\,V^{-1}$, largely different from the ideal diode constant at the same temperature $T = 47.8 \pm 0.2°C$ - $B_{id} = e/kT = 36.20\,V^{-1}$. The agreement of the model with the data requires a value:

$$n = \frac{B_{id}}{B} = 1.86 \pm 0.01$$

which is lower than the value of the SPICE models for 1N4148[17] diode but agrees with other experiments [18], pointing out the variability of this parameter due to constructive tolerance or data analysis.

A different treatment of data, often met in the literature, considers the large value of the product BV in the range investigated. In this case, one can neglect the term -1 in the parenthesis and can take the natural logarithm of the measured current, finding:

$$\log I = \log A + BV$$