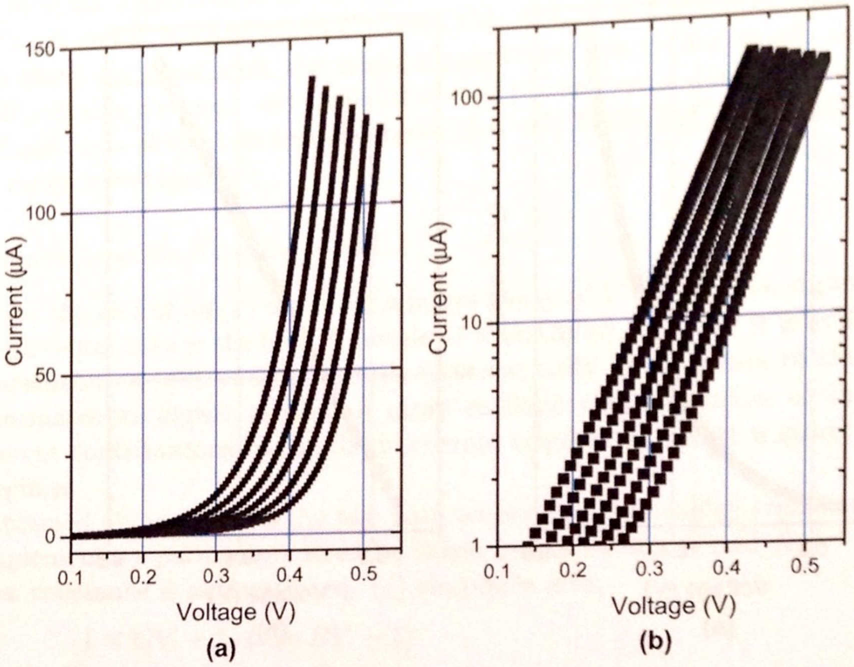

Figure 3. I-V pairs taken at six different temperatures (20.7 , 29.7, 39.3, 47.8, 57.2 and 66.3 °C, from right to left), in linear scale (a) and in $\log_{10}$ scale (b) of the currents; it is evident the alignment of the experimental points, suggesting the exponential dependence of I on V.

applying to the series diode-R the variable signal of a digital-to-analog channel (DAC) of the NI6221 board. The control of the thermal cycle and of the data taking is programmed realizing a LabVIEW virtual instrument. Initially, a set of temperatures is selected by the operator. After that the controlled thermal cycles operate until the value of each T is stable into few tenths of °C. The couples [V,I] are saved in a file and are labelled with the temperature measured just before and just after the voltage scan. The difference of two readings of the temperature is ever less than 0.5 °C in absolute value, the sign being dependent on the direction of the last heat flux cycle. So we can evaluate that the value of the diode temperature is known with a precision of 0.2 °C on average.

4. Results and Discussion

4.1. Shockley model

Fig. 3 shows a set of I–V curves taken at different temperature, plotted both in linear and logarithmic scale: it is evident in the right panel the alignment of the experimental points, which is so much better for the higher temperatures and at the higher value of V. The entire set of data required a time of less than ten minutes so that the measures could be done in a standard lab session of 2-3 hours leaving time for a preliminary data analysis and a possible reiteration of the data collection.

The linearity of the experimental I–V characteristic in the logarithmic current scale reported in Fig. 3b indicates, at glance, the region where it is likely an