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## Negative-differential-resistance effects in TlInTe<sub>2</sub> ternary semiconductor

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### ABSTRACT

Thallium indium ditelluride single crystals, were prepared by a special high efficiency, low cost, design, constructed locally, based on Bridgman technique. A special perspex sample holder and quartz cryostat were used to investigate the switching phenomena in TlInTe<sub>2</sub> single crystal. Current-controlled negative resistance (CCNR) has been observed for the first time. The switching effect observed in such crystal shows memory. The current–voltage (*i*–*v*) characteristics of the compound show two different regions: an ohmic region at low-current densities and a negative-differential-resistance (NDR) region at higher current densities. This behavior has been explained by an electrothermal model. The results strongly indicate that the phenomenon in our sample is very sensitive to temperature, light intensity and sample thickness as well. Switching parameters ( $i_{th}$ ,  $v_{th}$ ,  $i_h$ ,  $v_h$ ,  $P_{th}$  and  $R_{OFF}/R_{ON}$ ) are found to depend on the surrounding conditions as well as the sample thickness.