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THERMOELECTRIC POWER OF THALLIUM UP TO 6 GPa

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THALLIUM has a hexagonal close-packed (hcp) structure at room temperature and pressure, and transforms to a face-centred cubic (fcc) structure at 3.67 GPa. The hcp→fcc transifion in thallium is accompanied by a small decrease in volume (0.7%) but a large decrease (15%) in the electrical resistance. The details of the temperature-pressure phase diagram of thallium can be found in a review by Klement and Jayaraman[1]. In this note the thermoelectric power (TEP) of thallium up to 6 GPa has been- reported.

The thallium samples used for the present measurements were 99.999% pure from Research Organic/Inorganic Chem. Corp. USA. A tungsten carbide opposed anvil set-up with pyrophyllite gasket and epoxy as the pressure transmitting medium is used to pressurize the sprcimen. The details of the high pressure cell used for the measurement of TEP have been described elsewhere'. Briefly, a flirt specimen measuring 0.5 x 0.05 x 5 mm is placed in the gasket assembly. A temperature gradient is set up along the length (5 mm) of the specimen by heating one end with the help of a flattened resistance wire carrying current. The temperature difference between two points on the specimen abuut 2 mm apart is measured using two pairs of chromel-alumel thermocouples. The thermo e.m.f. generated at these points is also measured with a Leeds-Northrup nanovolt potentiometer (model K-5) using the thermocouple wires as the leads. The standard deviation in the measurement of TEP is 0.3 μVK^{-1}.

The variation of TEP of thallium as a function of pressure is shown in figure I. The average value of

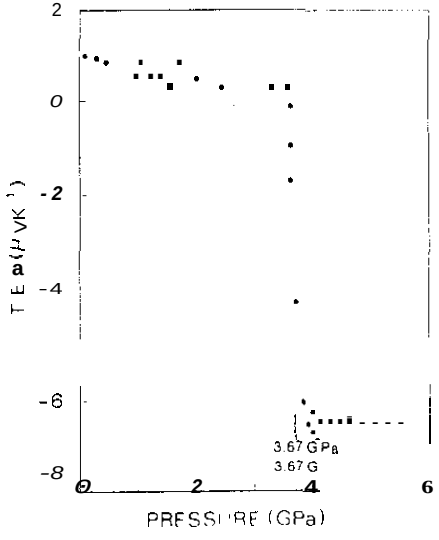

Figure 1. Thermoelectric power of thallium as a function of pressure at 300 K.

TEP at room temperature and pressure as obtained from the present measurement is 1.7 μVK^{-1}. This value is in good agreement with the value of 1.6 μVK^{-1} reported in literature[3]. With increase in pressure, TEP decreases, reaches a value of about 0.6 μVK^{-1} just before the hcp→fcc transition, and drops to -7 μVK^{-1} on completion of the transition.

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NITROGENASE DEREPRESSED MUTANTS IN *AZOSPIRILLUM*

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Iris not only with *Azospirillum* hut with almost all diazotrophs that the presence of combined nitrogen represses the key enzyme nitrogenase with the result that even a genetically engineered strain of nitrogen fixer ceases to fix nitrogen[1,2]. In this communication the development of mutants in *Azospirillum* derepressed for nitrogenase is reported.

Following the enrichment technique of Day and Dobereiner[3], a large collection of Arospirillum was made from the root tissues of cereals, minor millets, fodder grasses and also from a few weed plants. The pure cultures of Arospirillum were maintained on yeast extract glucose agar stabs. For selecting the efficient cultures for nitrogen fixation, the cultures were screened for nitrogen fixation following the methods of Humphries[4]. Isolates that fixed more than 20 mg of nitrogen per g **of** carbon were selected and the isolates were assayed for acetylene reduction activity (ARA) in a Perkin Elmer Gas Chromatograph (Model F.33) fitted with flame ionization detector. The conditions of the assay were essentially the same as reported earlier[5].

The influence of combined nitrogen on the nitrogenase activity of the selected cultures was studied by inco'rpornting graded levels of ammonium chloride in the nitrogen-free malate medium. It was of interest to observe that only one culture, TMV6 # **2,** an isolate from the roots **of** gingelly crop showed nitrogenase activity even at higher levels of ammonium chloride in the growth medium. Therefore we designated this as a spontaneous mutant. In order to obtain a large number of mutants, the parent culture, Pt.1, was exposed to the chemical mutagen, methyl methane sulphonate (MMS) at 100 μg per ml. The procedures followed were the same as described by Clowes and Hayes'.

The procedure adopted for the selection of the clones was based on the dye reduction technique'. This involved the streaking of the clones *on* indicator media. The mutant clones would he distinctly abnormal in colony colour on the indicator media. Malate medium containing **20** mM of ammonium chloride added separately with (i) hromothymol **blue** and hromothymol purple, (ii) eosine-methylene blue, and (iii) triphenyl tetrazolium chloride served as indicator media in this study. The clones that exhibited aberrant colony colour were picked up and purified by repeated streaking on the same media and maintained on yeast extract glucose agar stabs.

The ARA of the mutants along with the parent culture was examined as detailed earlier. The assay

Table 1 Effect of NH_4^+ *and NO;* ***on the ARA'*** *activity* of *the mutants* ***of*** *Azospirillum*

Mutants	Acetylene reduction *activity*				
	Under N_2	$+NH_4Cl$ (20 mM)	**Per** cent reduction	$+KNO_3$ (20 mM)	Per cent reduction
Pt.1	190.96	Nil	100.00	Nil	100.00
AZ.MMS # 2	166.98	68.60	58.92	98.00	41.31
AZ.MMS # 3	180.32	74.28	58.81	102.39	43.22
AZ.MMS # 4	146.47	39 26	73.20	84.71	42.16
TMV.6 # 2	176.78	56.66	67.94	158.12	10.56

Data represent mean of three determinations; * Activity expressed as nmol of ethylene produced hr^{-1} mg^{-1} protein.