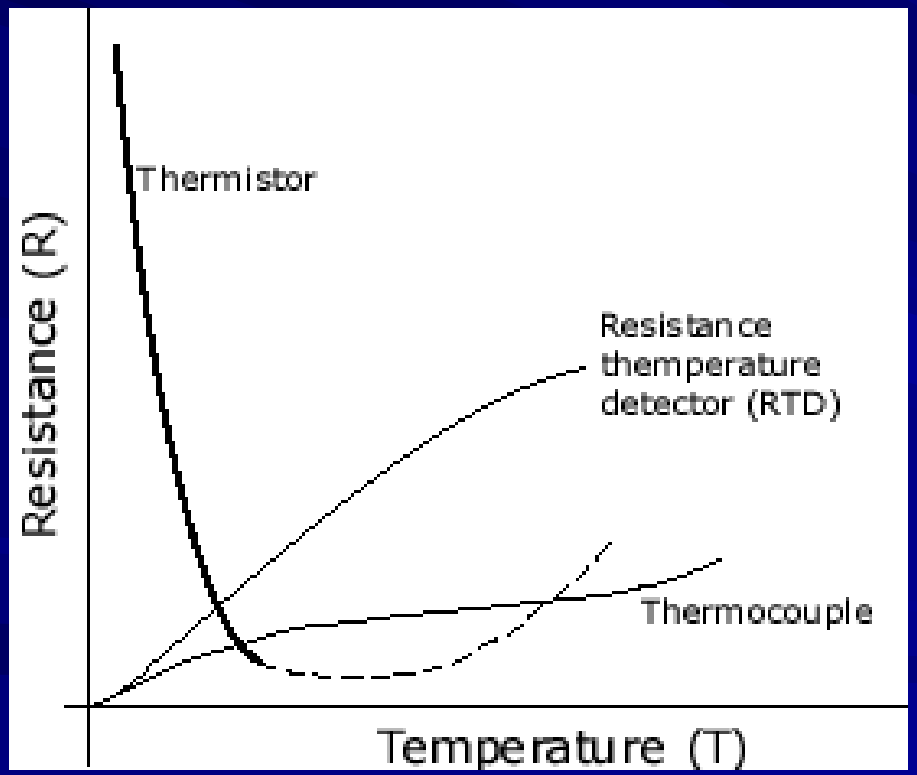
Pengaruh Penambahan Al_2O_3 Terhadap Karakteristik Keramik $CuFe_2O_4$ Untuk Termistor NTC

Wiendartun, Endi Suhendi,Andhy Setiawan [1])
Dani Gustaman Syarif , Guntur DS [2])

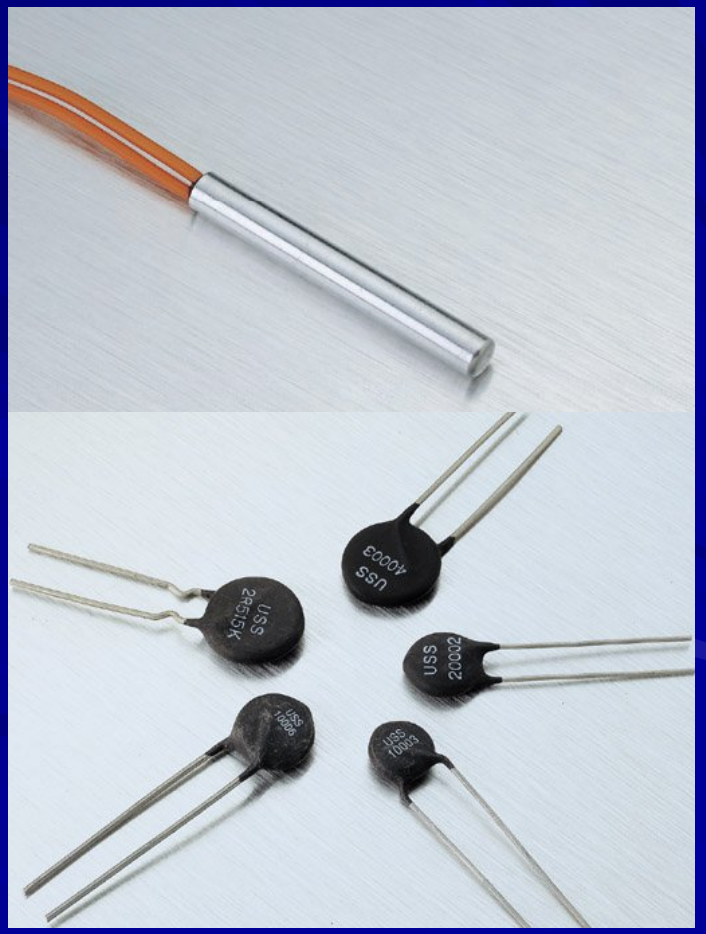
[1]) Jurusan Fisika FMIPA UPI Bandung.
[2]) Pusat Teknologi Nuklir Bahan dan Radiometri BATAN Bandung.

PENDAHULUAN

- THERMISTOR→ Thermally Sensitive Resistor.
- KARAKTERISTIK NTC :



CONTOH PRODUCT :



PENDAHULUAN (Lanjutan)

- Komponen Elektronik Penting.

  - Sectors: Kedokteran, ruang angkasa, instrumentasi, otomotif, telekomunikasi, dan HVACR (Heating, Ventilation, Air conditioning and Refrigeration).

  -Applikasi : Pengukur suhu, komputer, pembatas arus listrik, sensor aliran air dan sensor tekanan.
- Kebanyakan, thermistor dibuat dari keramik berstruktur spinel pada oksida logam transisi, rumus umumnya berbentuk AB_2O_4.
- Perlu alternatif (khususnya berbahan dasar yang melimpah di Indonesia, e.g. hematite)→ membuat keramik $CuFe_2O_4$, meliputi penamahan dengan Al_2O_3.
- Memprediksi bahwa penambahan Al_2O_3 dapat memperbaiki karakteisistik keramik $CuFe_2O_4$ pada thermistor NTC.

EXPERIMENT

CuO

Fe_3O_4

Al_2O_3

CAMPUR

800°C/2h

KALSINASI

GERUS

AYAK

3,9 ton/cm²

TEKAN

1200°C/2h

SINTERING

KARAKTERISASI
-XRD
-Listrik
-StrukturMikro

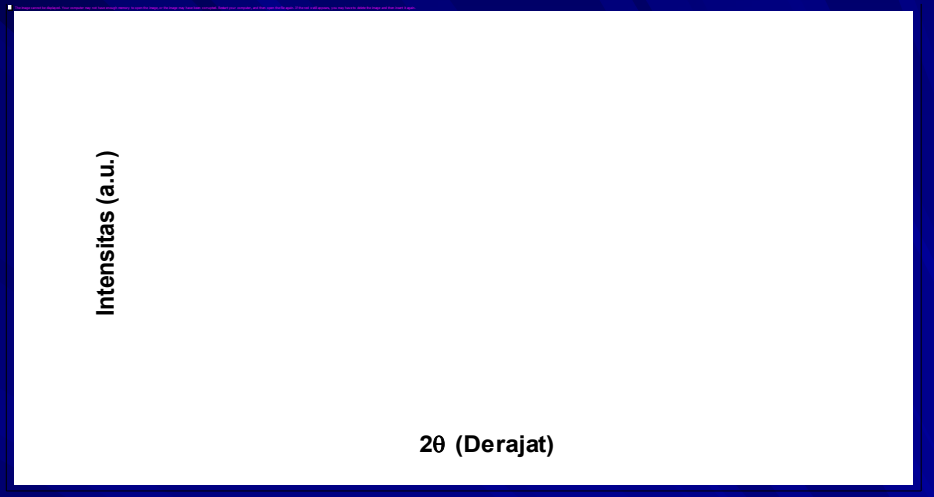
Sintering Furnace

XRD

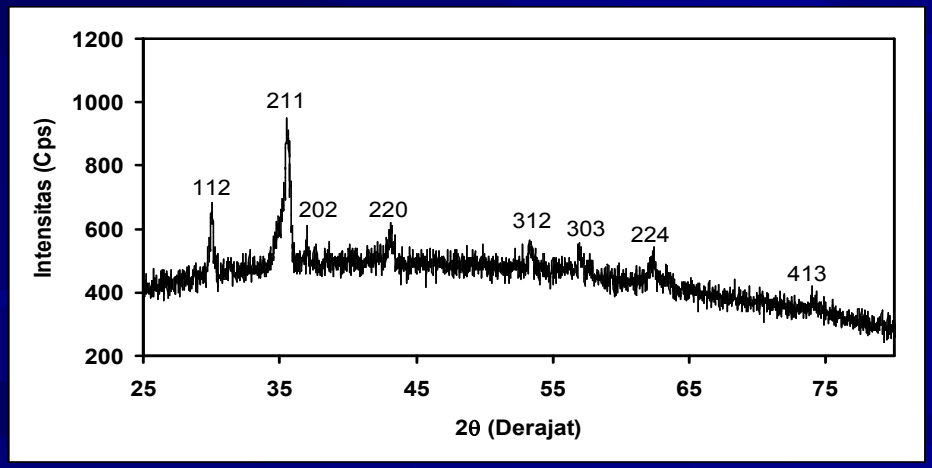
Optical Microscope

HASIL (XRD)

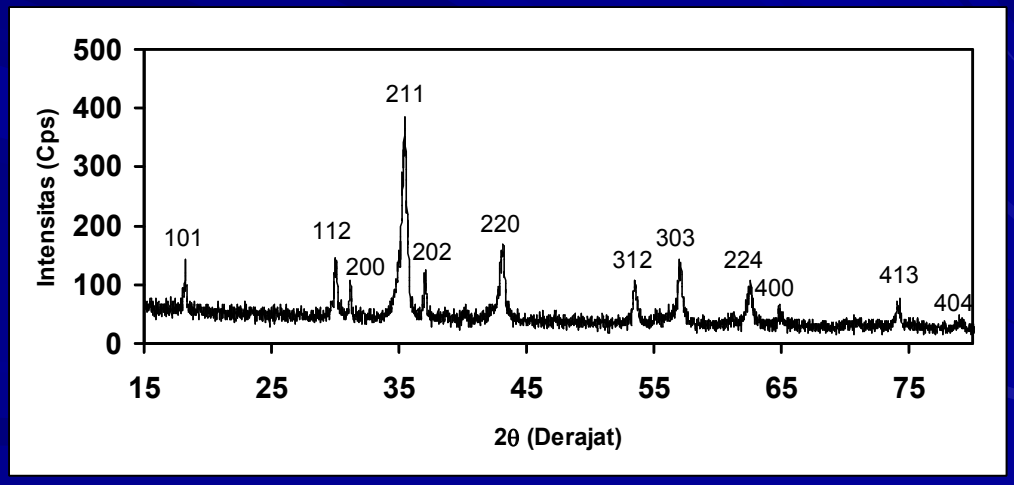
Tampilan visual pelet keramik CuFe2O4



0 w/o Al_2O_3



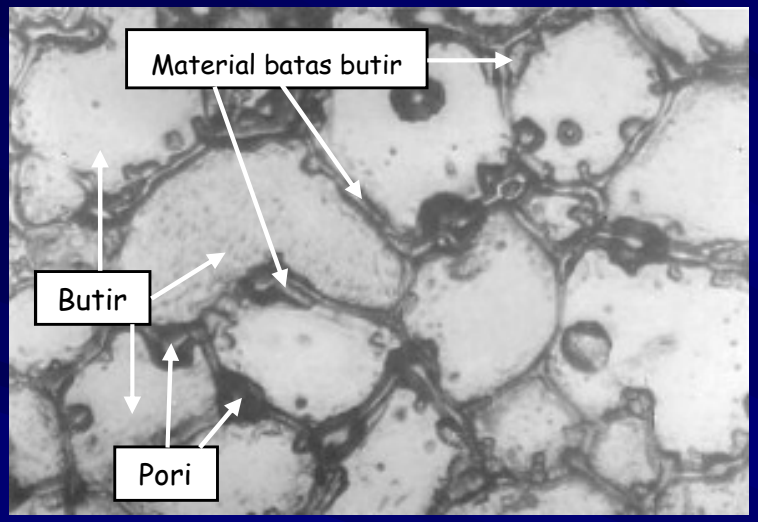
0.25 w/o Al_2O_3



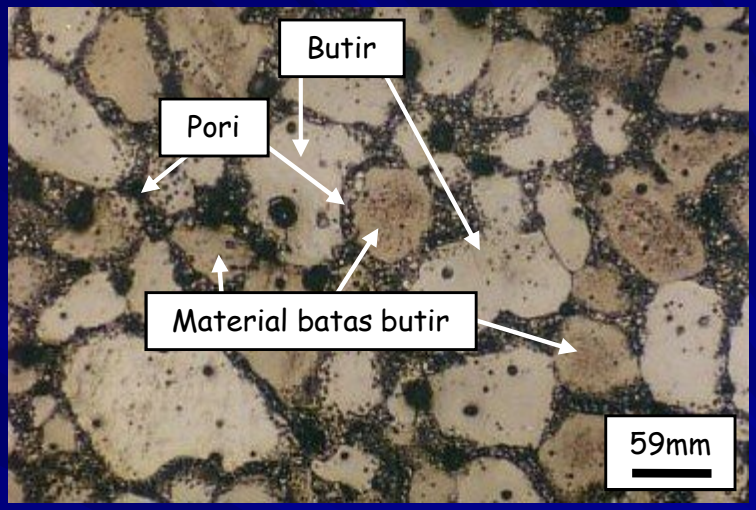
0.75 w/o Al_2O_3

XRD profiles of $CuFe_2O_4$ based-ceramics.

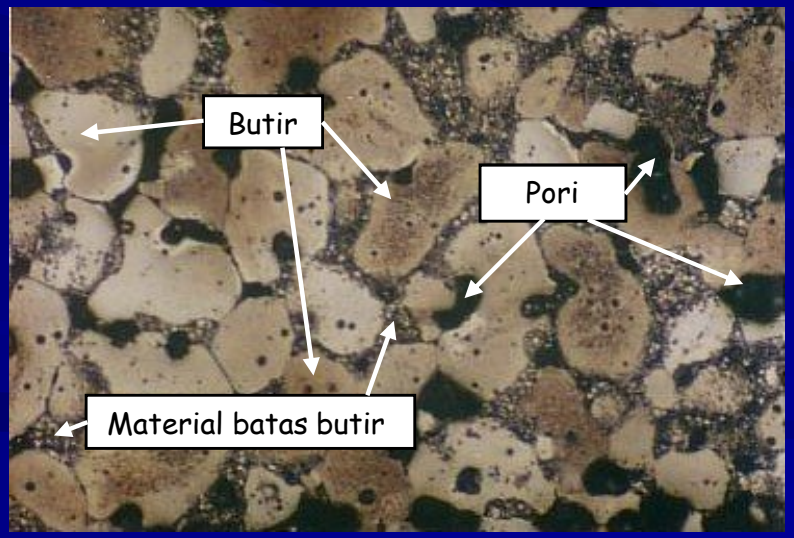
HASIL (Strukturmicro)



0 w/o Al_2O_3



0.25 w/o Al_2O_3



0.75 w/o Al_2O_3

Microstructures of the $CuFe_2O_4$ based-ceramics.

HASIL (Karakteristik Listrik)

Ln resistivity (ρ) vs $1/T$ of Al_2O_3 added- keramik $CuFe_2O_4$.

HASIL (Karakteristik Listrik)

No.	Additive of Al_2O_3 (w/o)	B (^oK)	α (%/^oK)	ρ_{RT} (Kohm-cm)
1.	0	2548	2.83	290
2.	0.25	2378	2.64	217
3.	0.75	2590	2.88	818

Market requirement for B is ≥ 2000 ^oK and α is ≥ 2.2 %/ ^oK, and Ea is 0.1 -1.5 eV [7], market requirement for ρRT = 10 ohm.cm-1 Mohm.cm [4].

KESIMPULAN

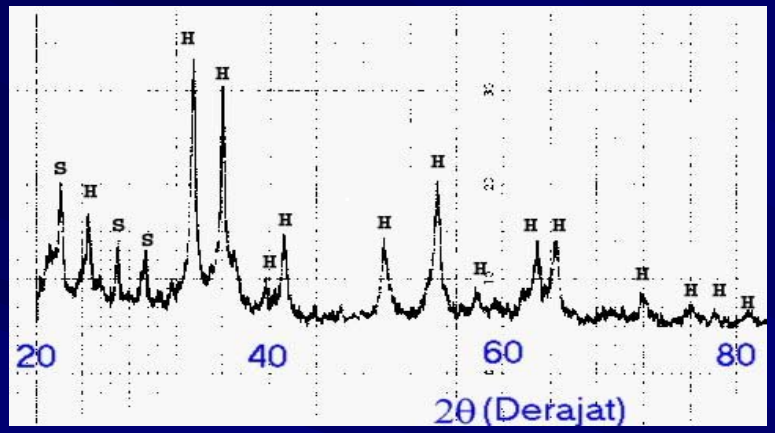
- Keramik $CuFe_2O_4$ dapat dipakai sebagai thermistor NTC.
- Penambahan Al_2O_3 membuat ukuran butiran pada keramik CuFe2O4 cenderung mengecil.
- Penambahan Al_2O_3 menaikkan resistivitas suhu ruang (ρRT) dan konstanta termistor (B).
- Nilai (ρRT) dan (B) dari keramik $CuFe_2O_4$ yang dibuat ini, memenuhi kebutuhan pasar.

TERIMAKASIH

HIBAH PEKERTI, DIKTI
No.014/DP2M/2006

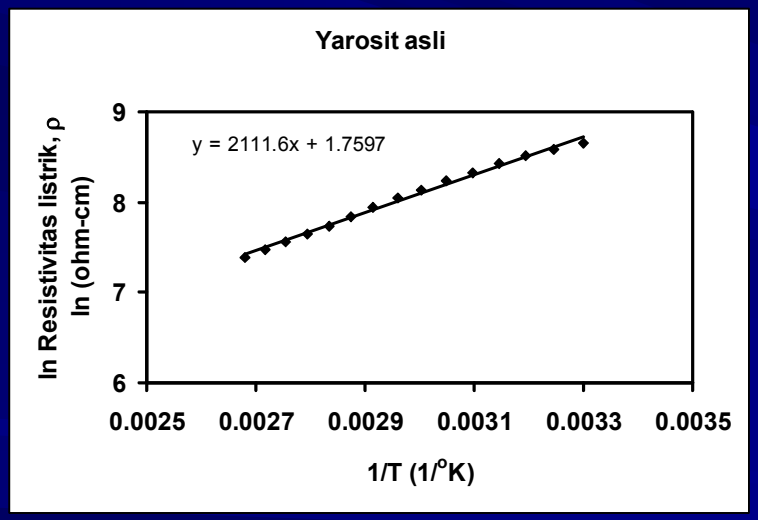
LAMPIRAN

JALUR 1: Yarosit asli



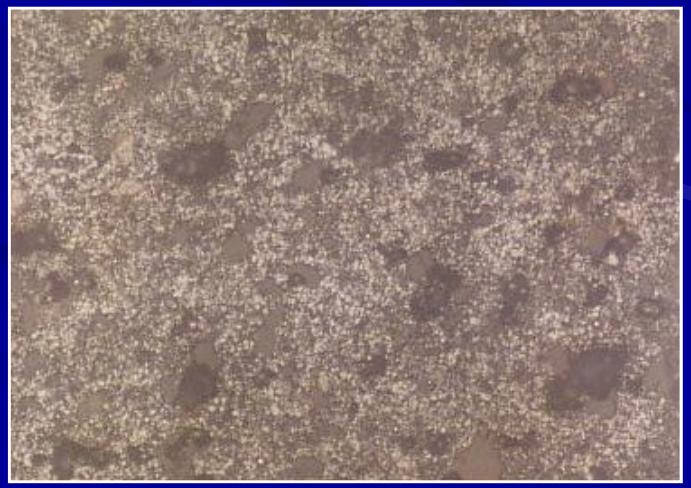
No.	Zat	% Berat
1.	Fe_2O_3	91,30
2.	Al_2O_3	3,30
3.	SiO_2	2,05
4.	TiO_2	3,02
5.	CaO	0,16
6.	MnO	0,17

Komposisi kimia hasil olahan

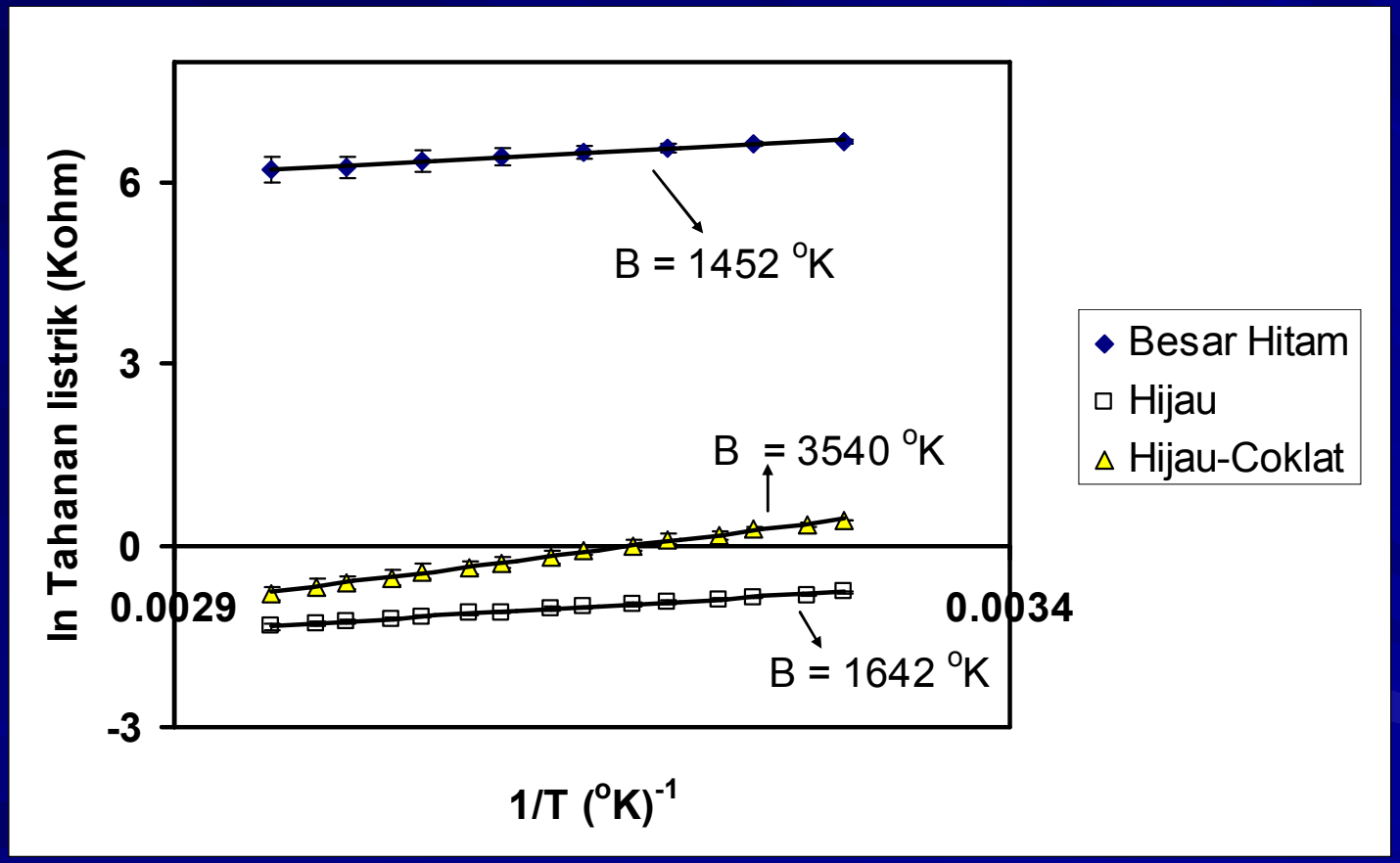


Pelet sinter CuFe2O4

41 μm



Termistor Pasaran (Bandung)



Persyaratan Pasar

- $B \geq 2000^{o}K$
- $\alpha \geq 2{,}2\%/^{o}K$
- ρ_{SR} = 10 ohm.cm – 10^{6} ohm.cm

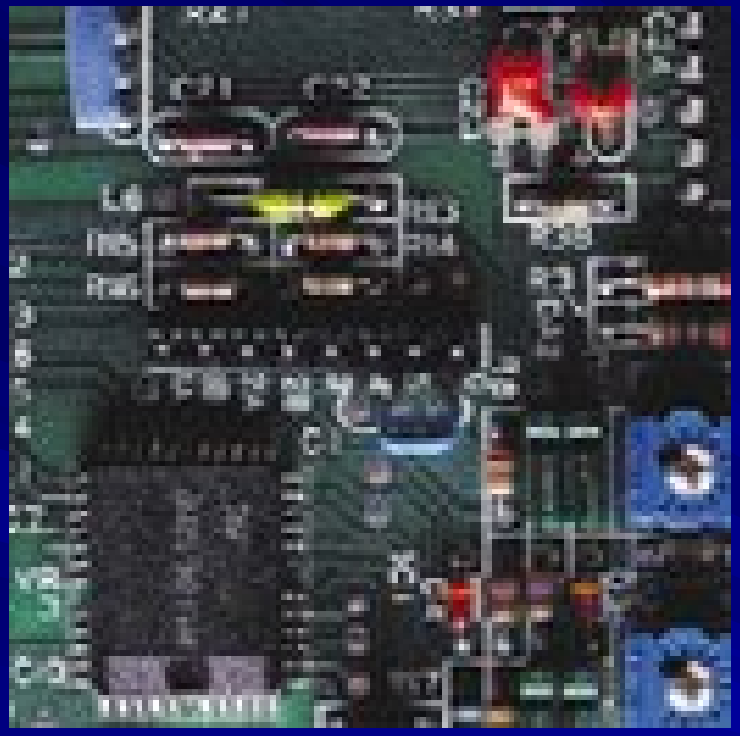
REKAPITULASI

	B	α	ρ_{SR}	Kekuatan
Yrst asli	√	√	√	×
FCASTO Import	√	√	√	√
Yrst olahan	√	√	√	√

APLIKASI THERMISTOR

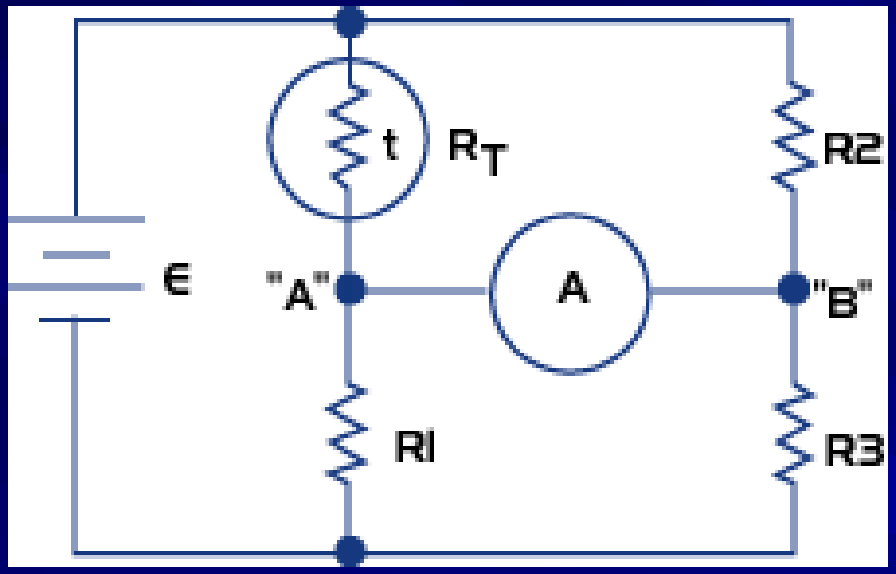
Inkubator Bayi

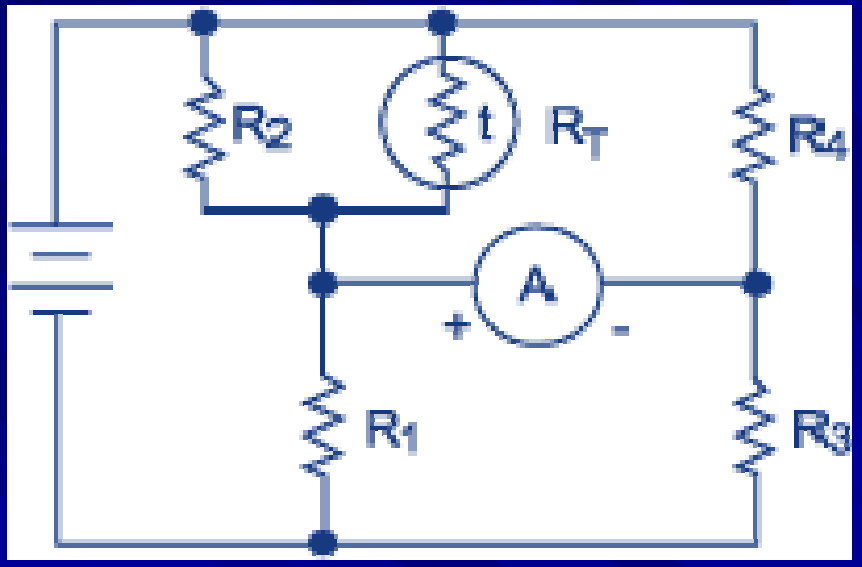
BIDANG APLIKASI THERMISTOR



Komputer

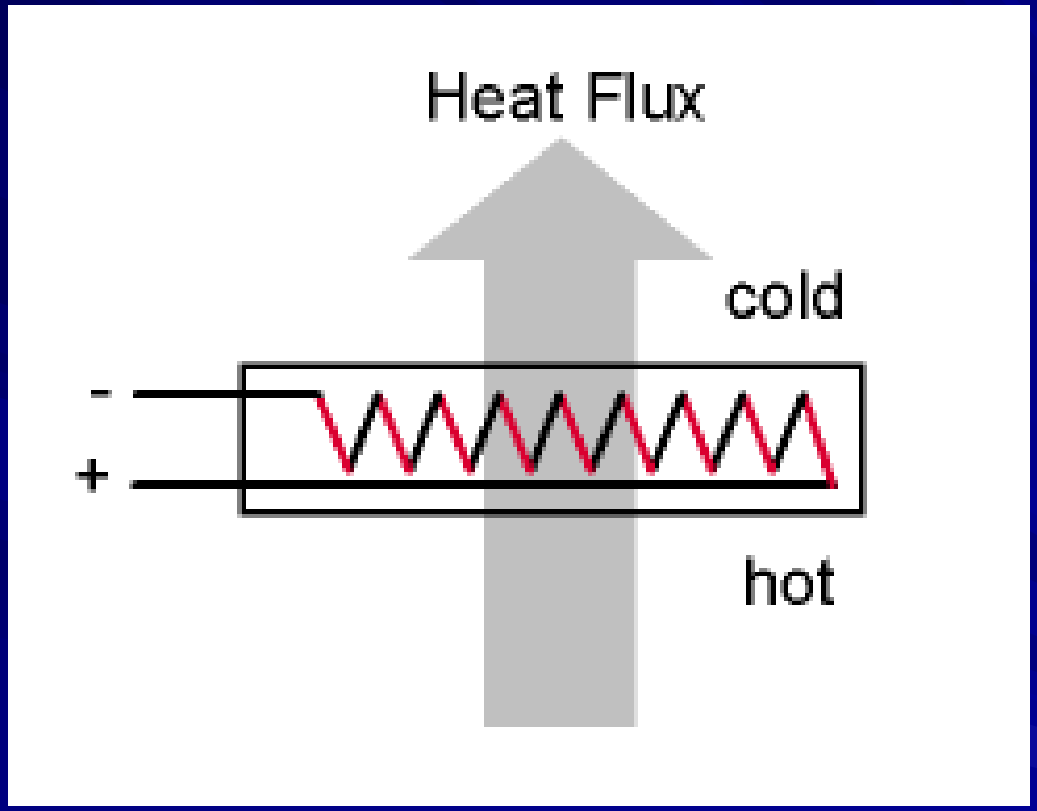
APLIKASI THERMISTOR





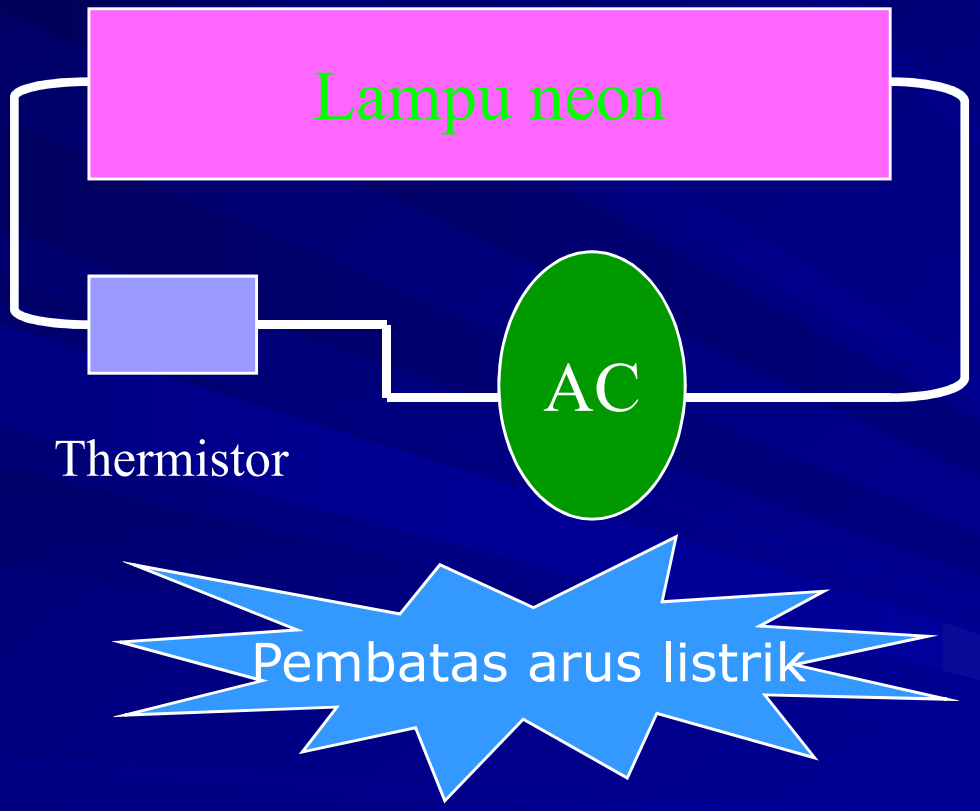
Pengukur suhu

APLIKASI THERMISTOR

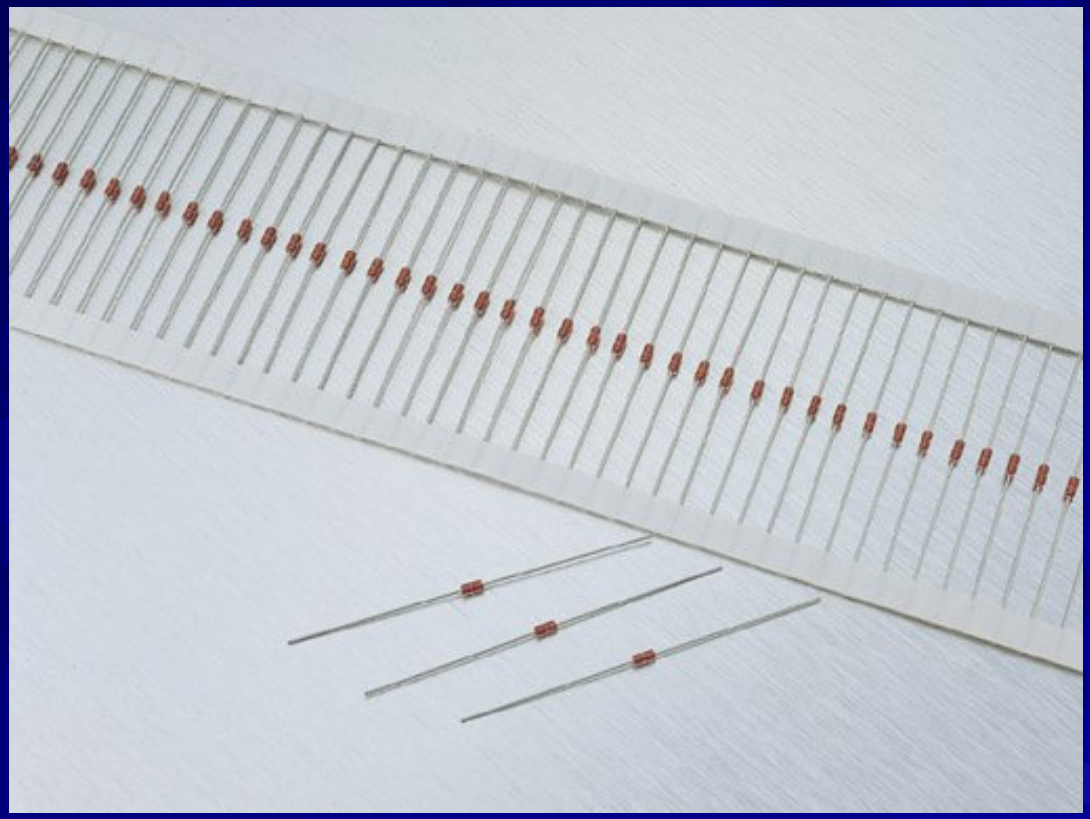


Sensor Aliran Air

APLIKASI THERMISTOR



BENTUK THERMISTOR



Thermistor Gelas

BENTUK THERMISTOR

Thermistor Lead Epoxy