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# Why this project?

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- thermal noise
- glass metals as a possible material
- need homogeneity
- need diagnostic for

**Crystalline  
contamination**

Continuation of work of Brian and Eric

My main aim

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# Validation of X-ray technique

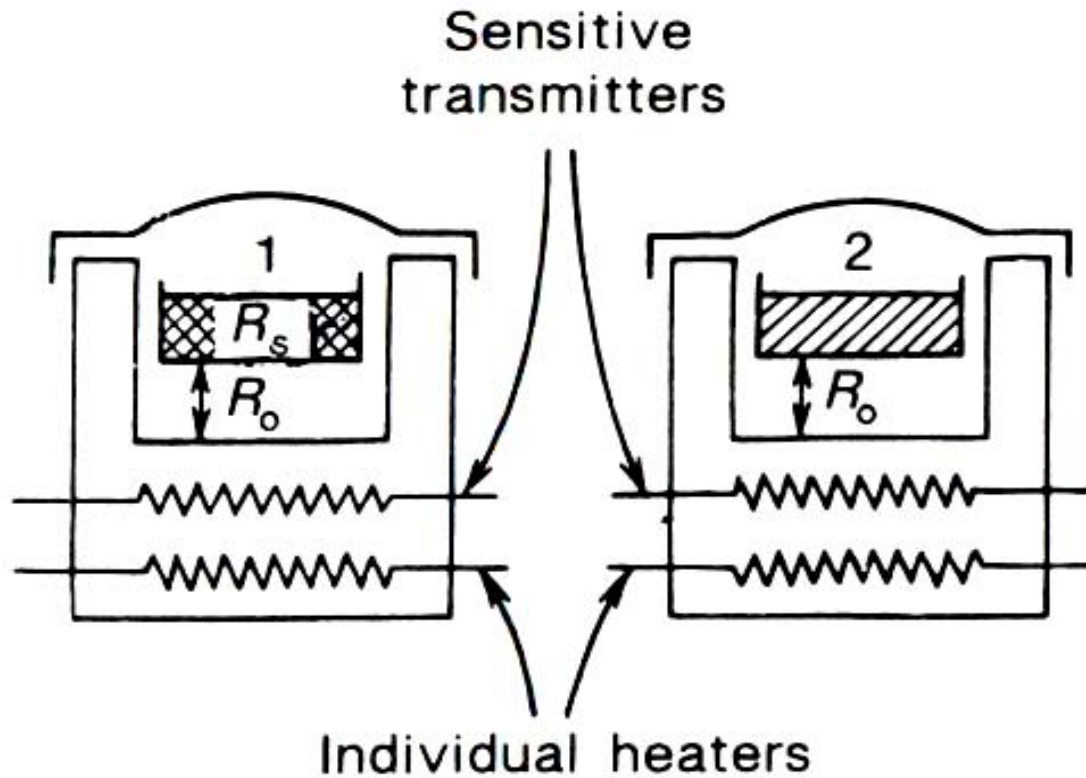
# Discussion points

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**Experimental methods: X-ray scattering to be validated via calorimetric measures**

**Choice and preparation of the alloy**

# DSC Measures



# DSC Uses

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DSC can detect and measure

- phase transition enthalpies
- glass transitions
- purity and **cristallinity** of samples

# DSC Crystallinity Measures

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$\Delta H_x$  is a measure of **Crystallinity**  
percentage in a sample so:

$$\text{Crystallinity} = 1 - \Delta H_x / \Delta H_x^0$$

# DSC Crystallinity Measures

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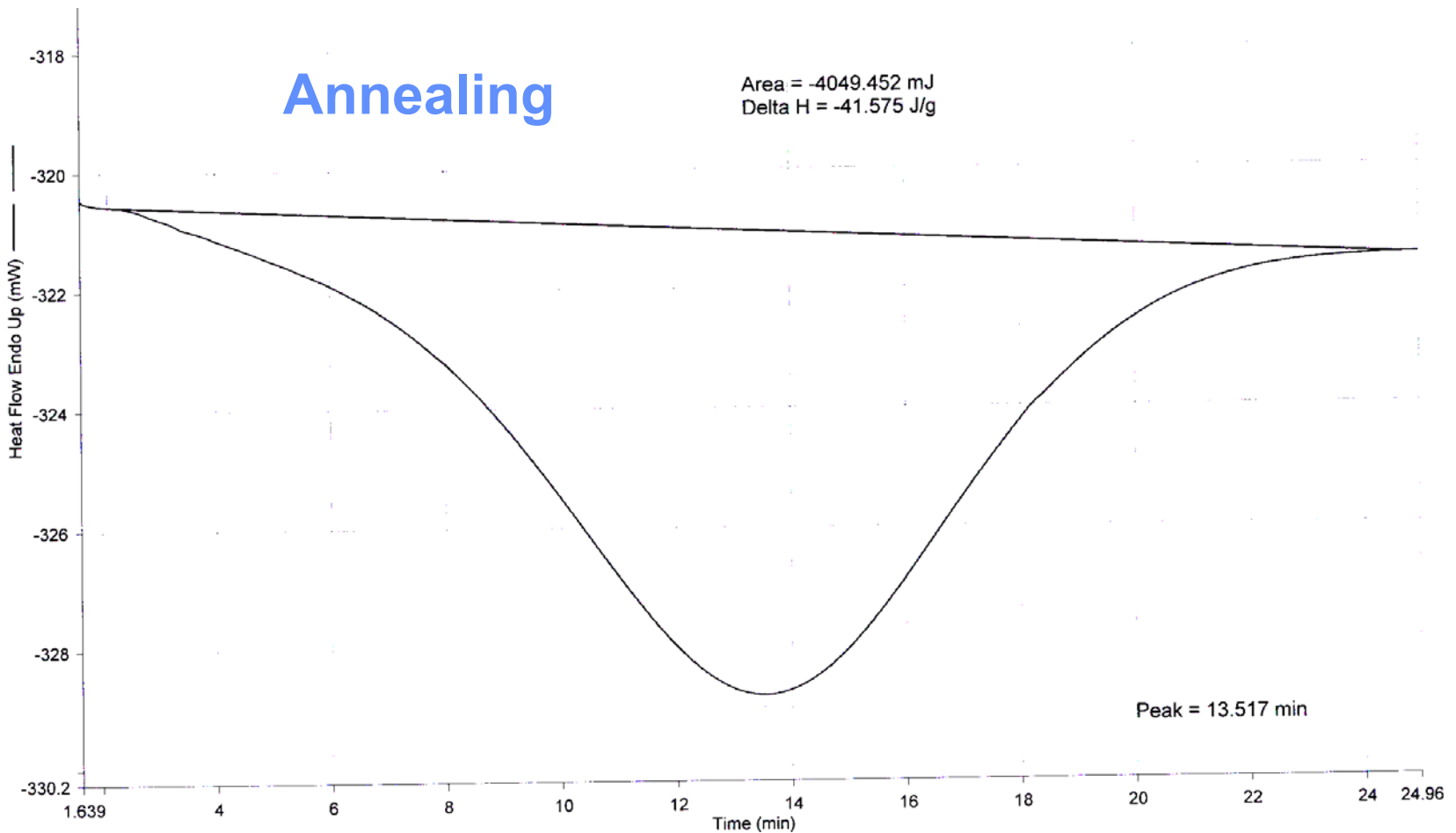
How to get the best measures?

Get the best measure of

$$\Delta H_x^0$$



# DSC Crystallinity Measures



# DSC Crystallinity Measures

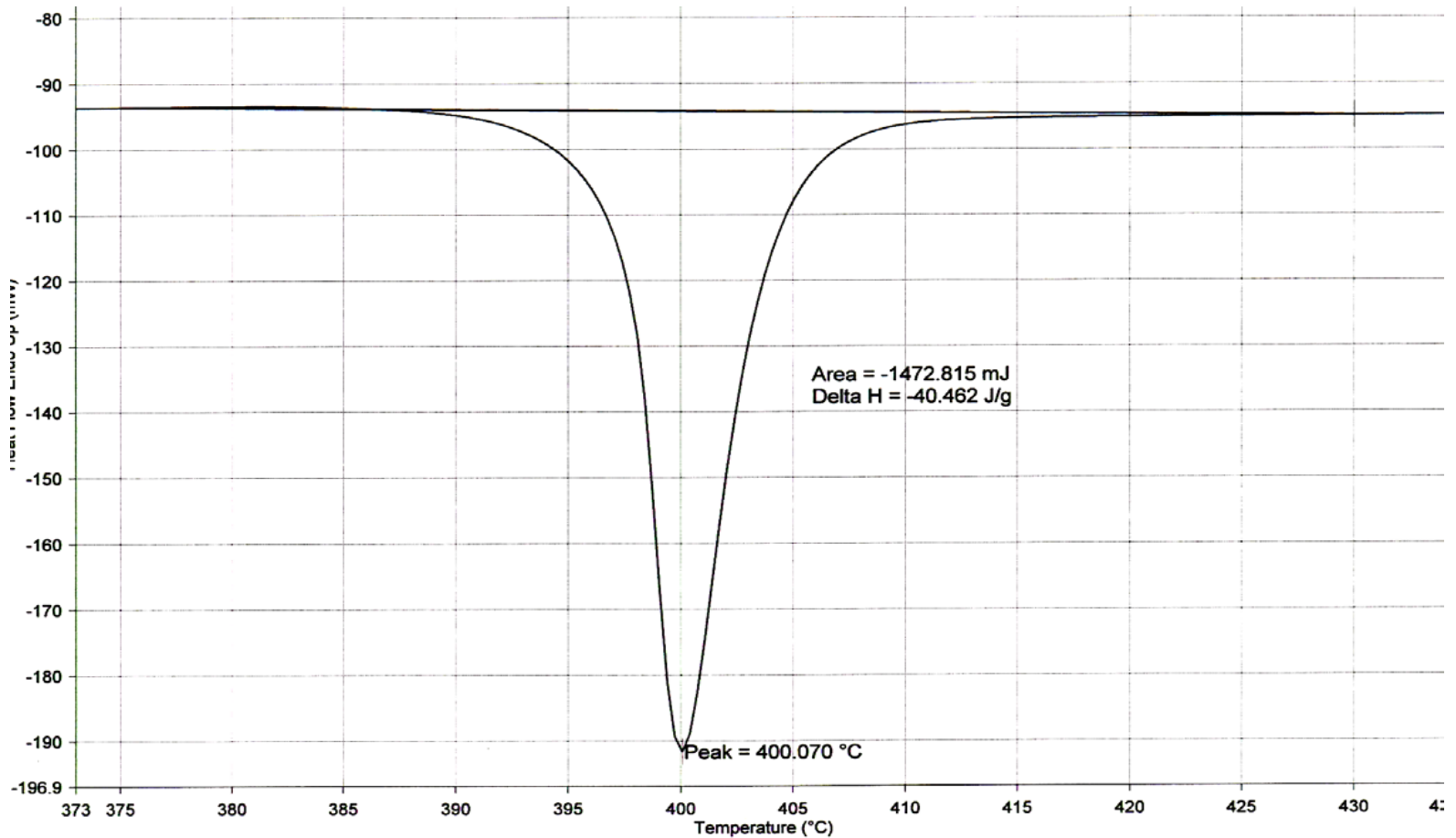
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Define a standard for  $\Delta H_x$  measures

- Reduce  $R_s$

- Fix **extremes** of peak calculation

# Example of DSC measure



# Limits of DSC

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- high temperatures [not our case]
- complex signal [peak definition]

**destructive** technique

What can we do?

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NO problem!

**We use X-rays**

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# Choice and preparation of the alloy

Why not MoRuB?

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# Temperature problem

# Why $\text{Pd}_{43}\text{Ni}_{10}\text{Cu}_{27}\text{P}_{20}$ ?



- has a **great** Glass Forming Ability [GFA]
- presents **only one** peak of crystallization
- is a **low** melting alloy



# $\text{Pd}_{43}\text{Ni}_{10}\text{Cu}_{27}\text{P}_{20}$ preparation some problems



## Phosphorus powder



# $\text{Pd}_{43}\text{Ni}_{10}\text{Cu}_{27}\text{P}_{20}$ preparation some problems

Reduce the title of pure P

**Use  $\text{Cu}_{.85}\text{P}_{.15}$  alloy**

# $\text{Pd}_{43}\text{Ni}_{10}\text{Cu}_{27}\text{P}_{20}$ preparation

## Working composition



Pure P title has been reduced of 25 %

- Arc melting failure

a solution:

**Induction coil melting**

$\text{Pd}_{43}\text{Ni}_{10}\text{Cu}_{27}\text{P}_{20}$  preparation



# Samples preparation



# Samples preparation



# Samples preparation





## What's left?

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Analyze samples with **X-ray diffraction**

Analyze samples with **DSC**

**Compare measures**

# Acknowledgements

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Thanks to

**SURF PROJECT**

- **Prof. Francesco Fidecaro**
- **Prof. Bill Johnson**
- **Chris Veazy, grad student**

**..and of course**

**my mentor**

**Prof. Riccardo DeSalvo**

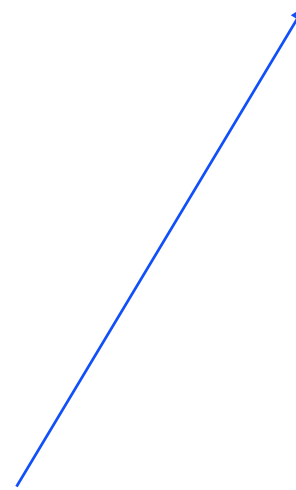
# Acknowledgements

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## LIGO STUFF

Chiara, Hareem,  
Francesco, Xavier,

They have a car....



**Juri, Charles and Greg**







**Juri & Chiara**



**Xavier**

**Greg**



Francesco





**Charles**



## Hareem



and of course...

**Riccardo**