NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE

CHRNS
CENTER FOR HIGH RESOLUTION NEUTRON SCATTERING

Magnetic properties of chemically-tuned nickel compounds

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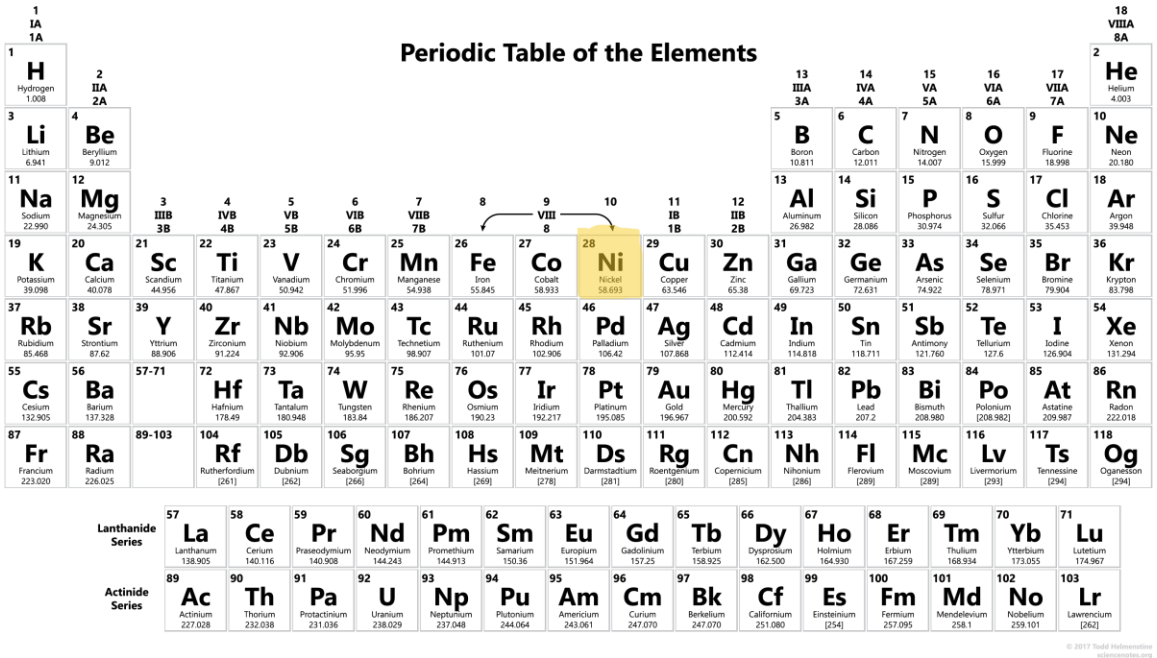
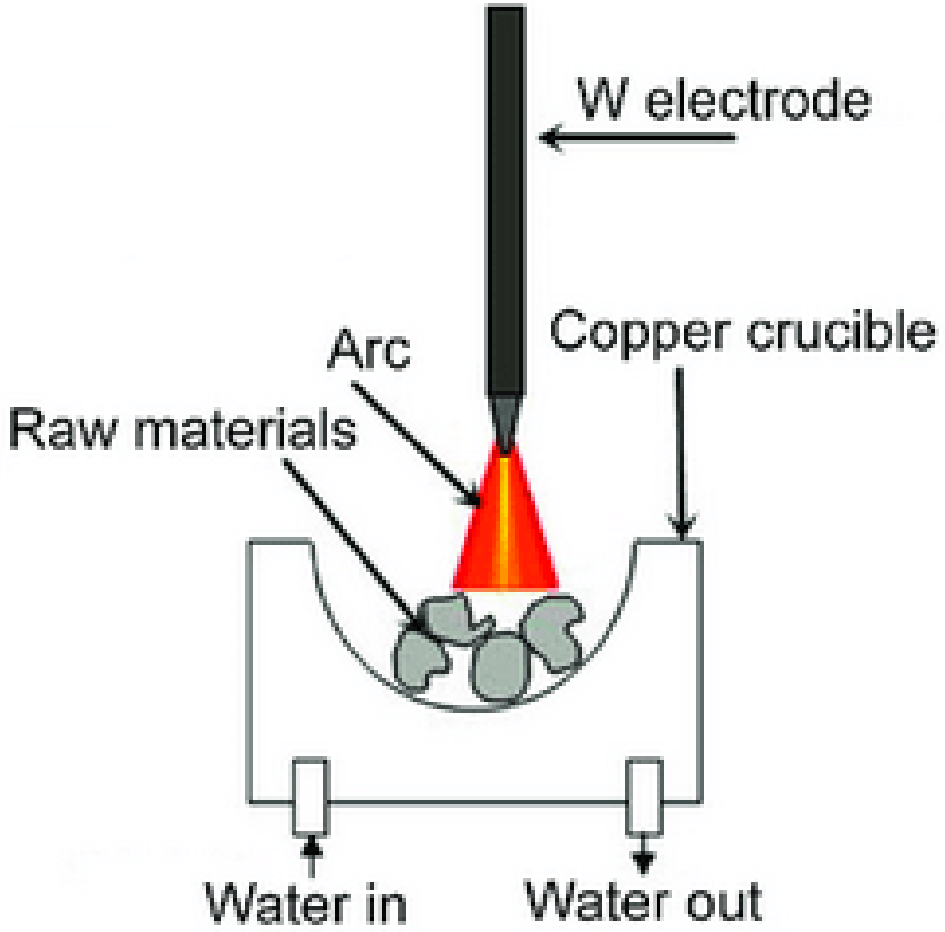
My Goal

I aim to study a series of nickel compounds with variable chemical compositions with magnetic properties varying controllably since

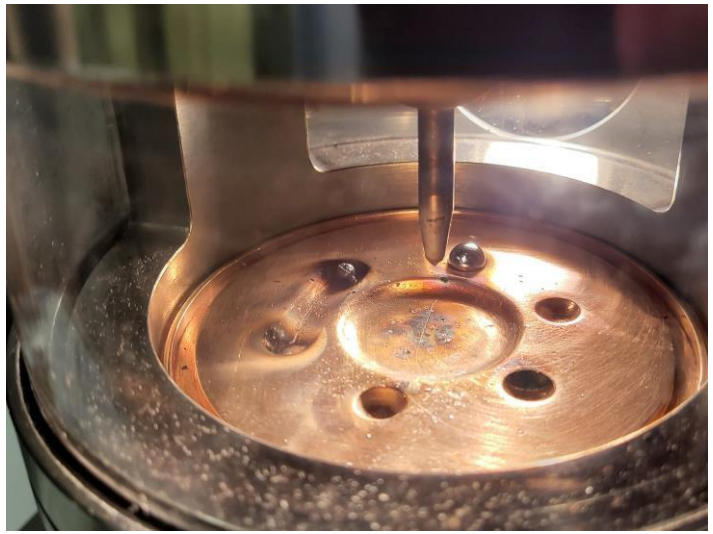
- Nickel is one of the few elemental metals to display ferromagnetic order
- Chemically modifying it can vary its magnetic properties



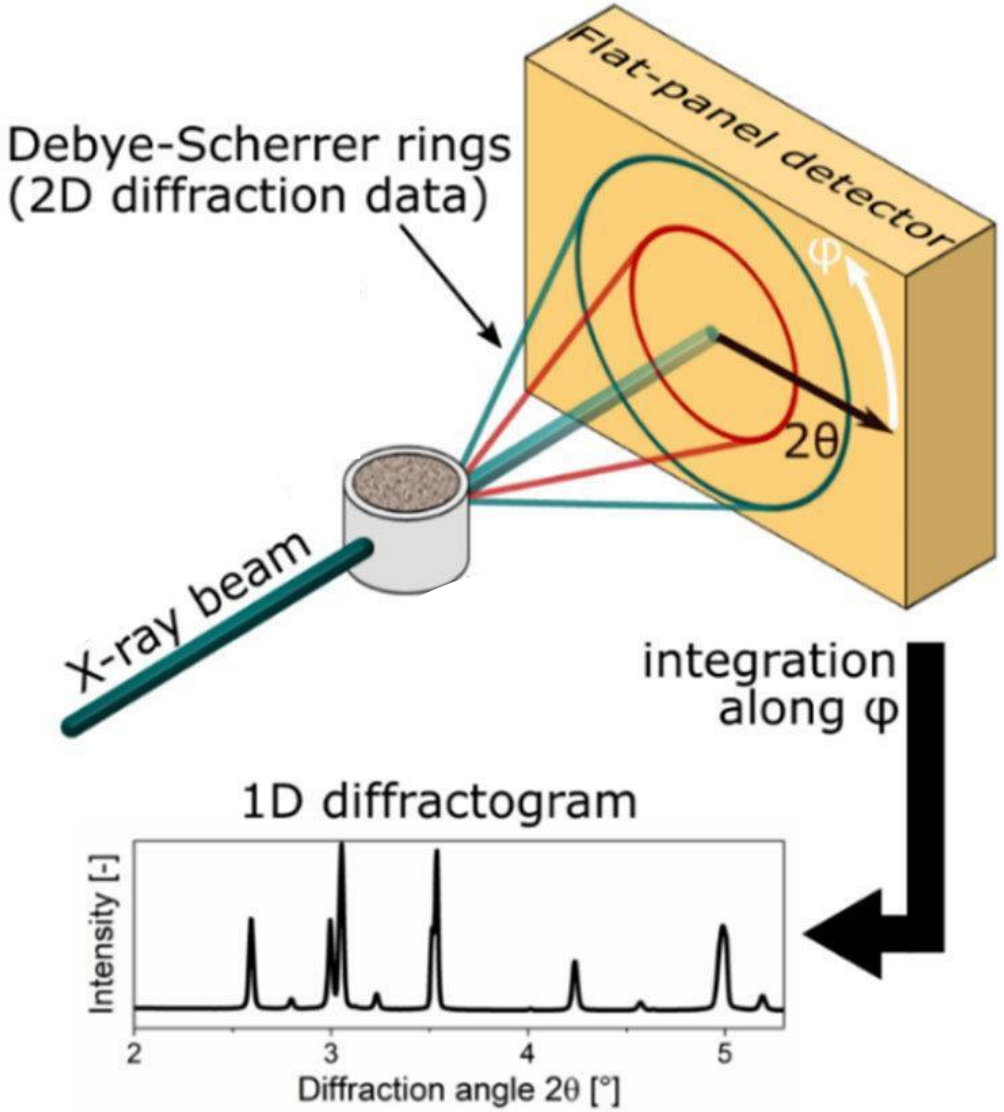
Synthesis Method: Electric Single Arc Furnace



Credit: https://www.researchgate.net/figure/Figure-S2-Schematic-diagram-of-the-vacuum-arc-melting-furnace-with-non-consumable_fig9_336984599



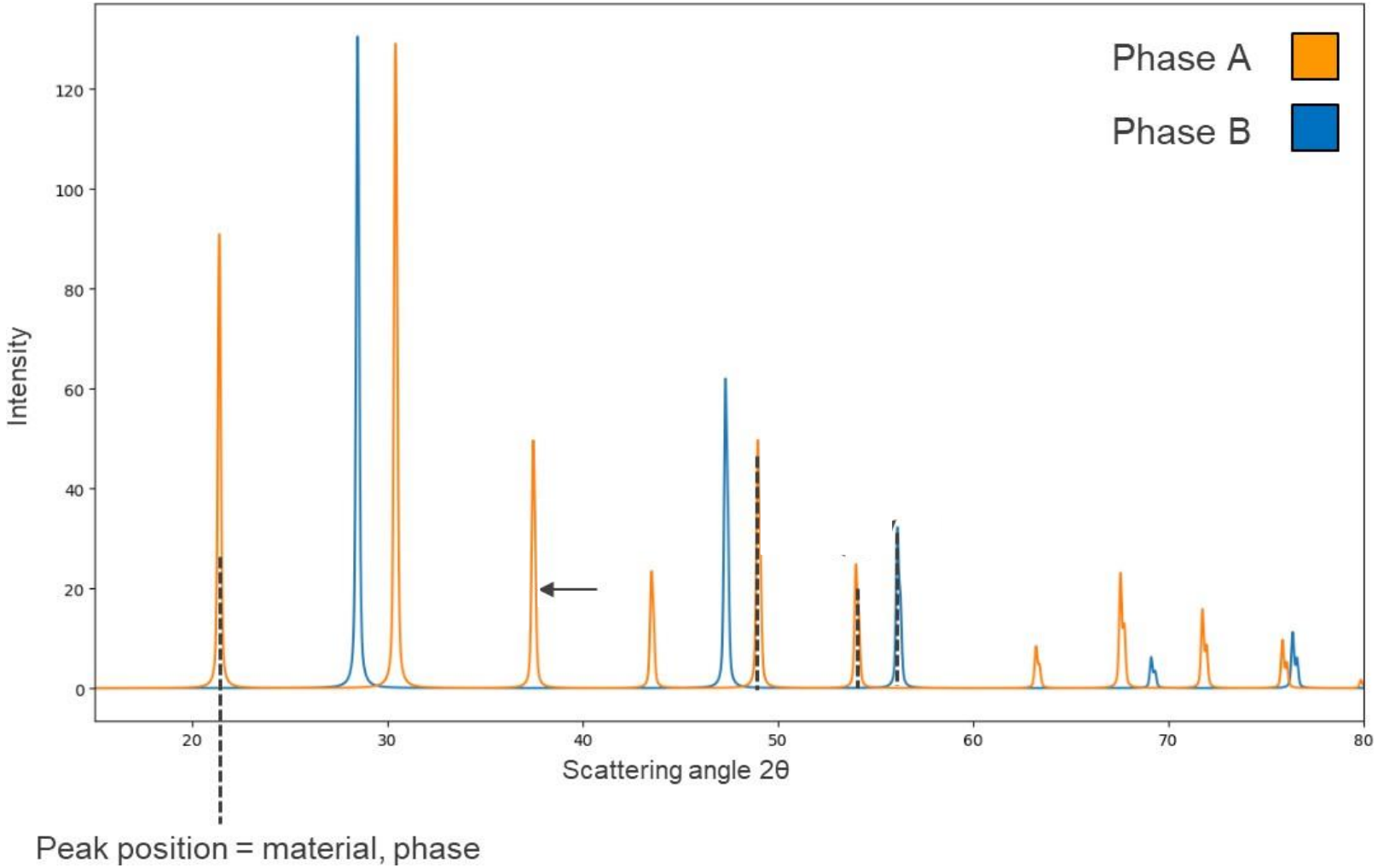
Analysis Method: Powder X-ray Diffraction



Credit: https://www.researchgate.net/figure/Schematic-view-of-the-in-situ-powder-X-ray-diffraction-XRD-experimental-setup-in_fig1_349595963

The distance between atoms, d, is related to the x-ray diffraction pattern by Bragg's Law: $n\lambda = 2d \sin\theta$

Analysis Method: Phase Identification



Profex

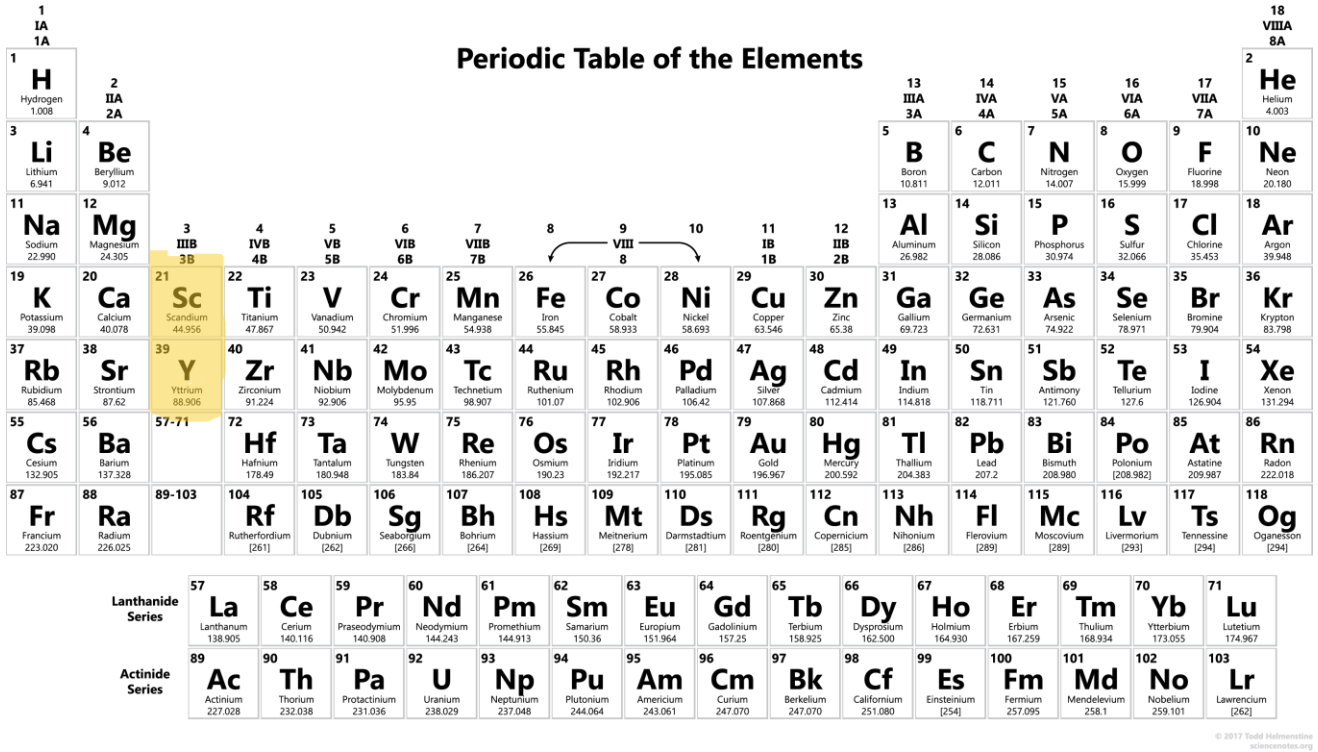
Credit: https://wiki.anton-paar.com/en/x-ray-diffraction-xrd/

Scandium-Nickel Compounds w/ Yttrium Substitution

Scandium is doped with yttrium since they are in the same periodic group (column in the periodic table).

Investigated or Investigating:

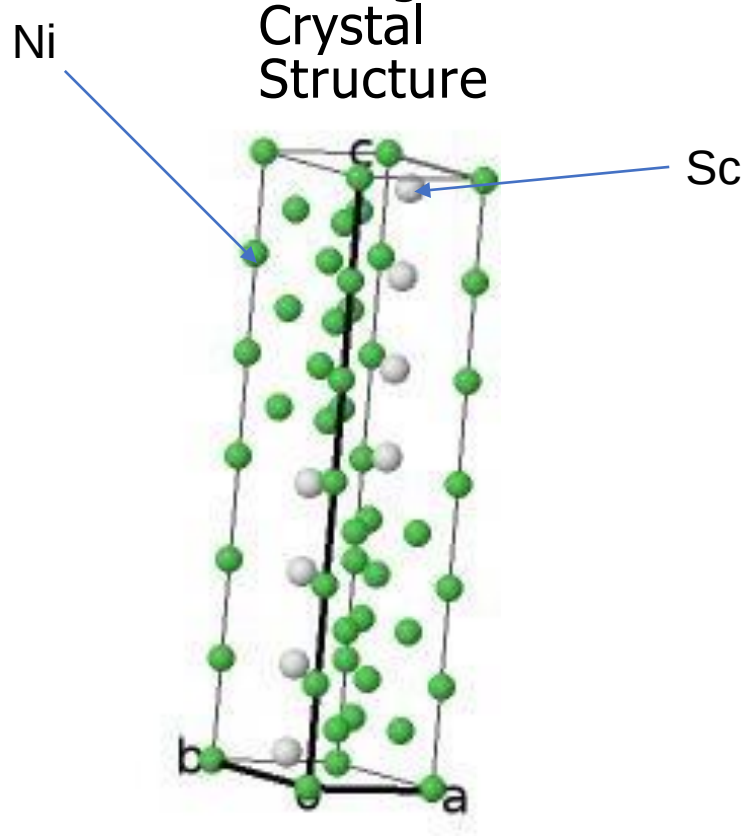
- $ScNi_2$
- Sc_2Ni_7



Sc_2Ni_7 and Y_2Ni_7

Sc_2Ni_7

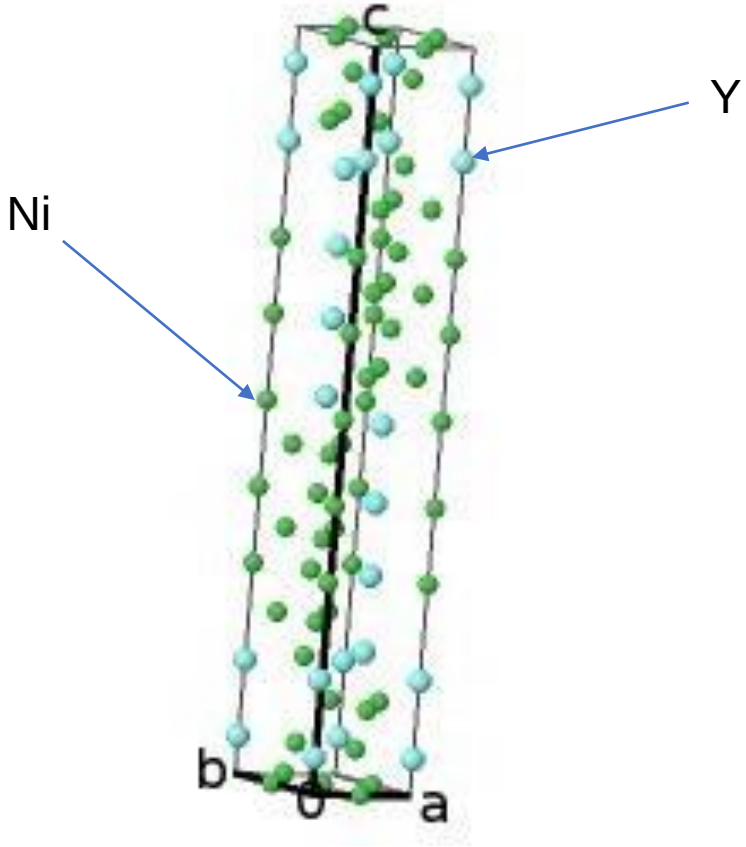
- Tetragonal Crystal Structure



DOI: 10.1016/0022-5088(68)90142-2

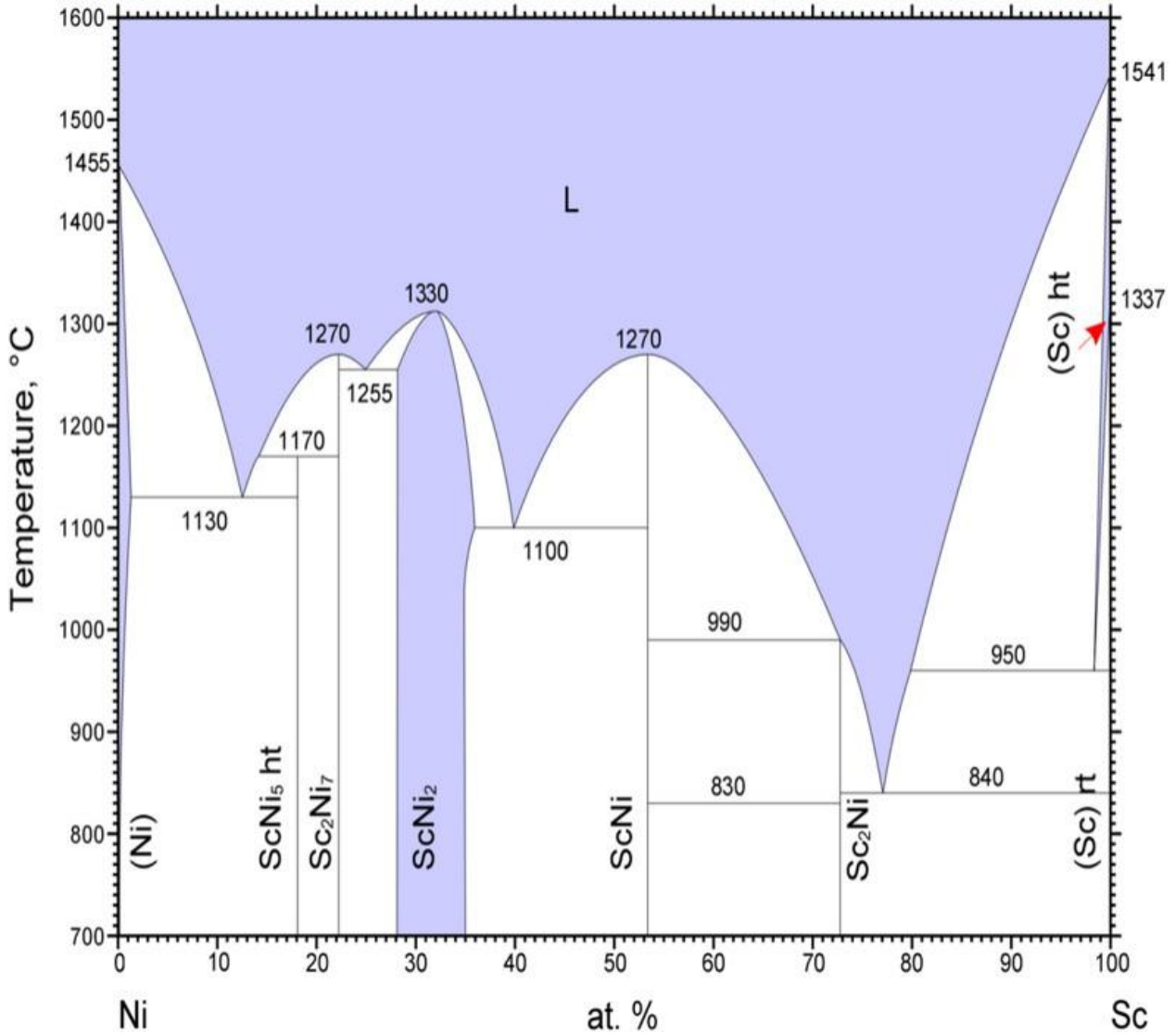
Y_2Ni_7

- Tetragonal Crystal Structure



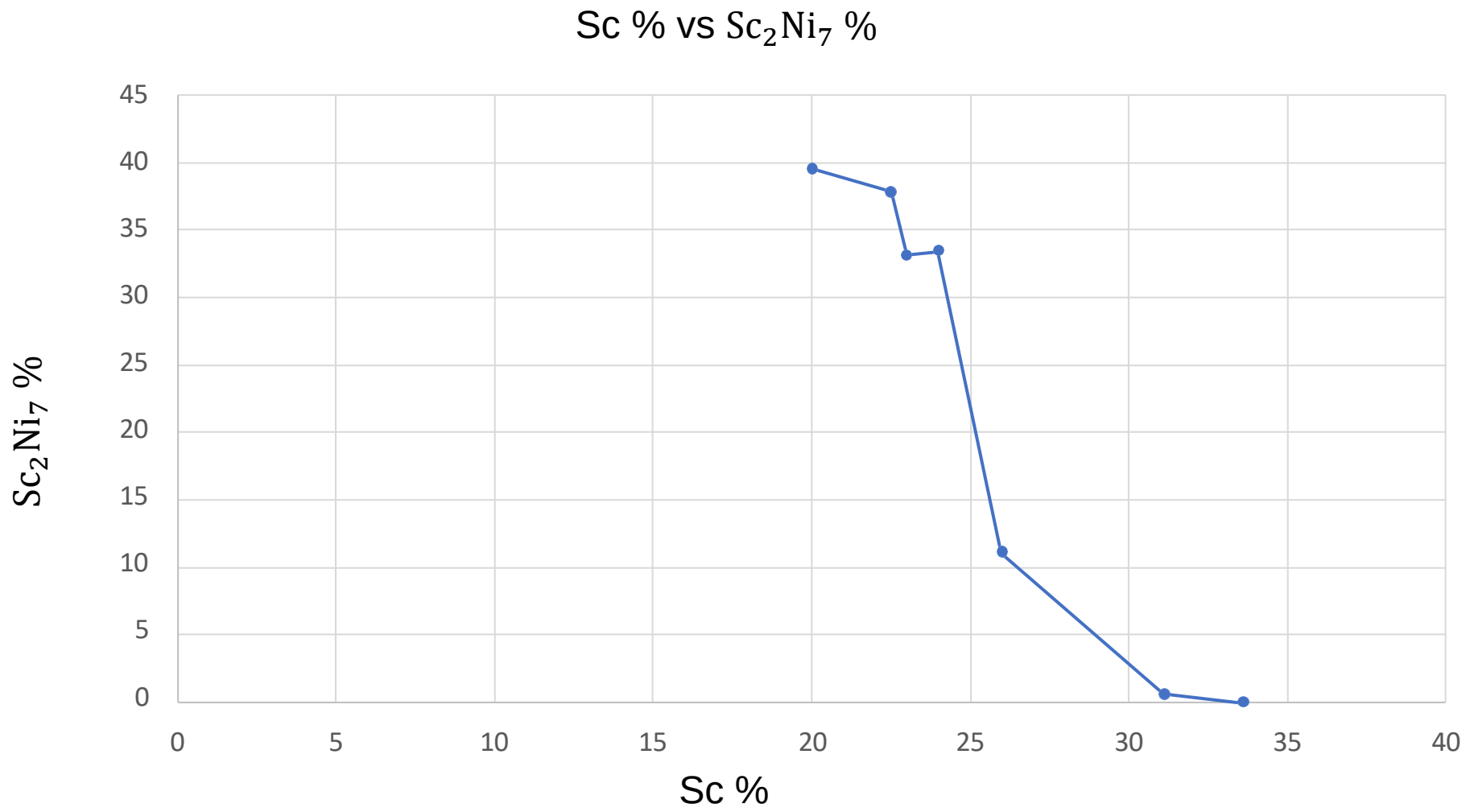
DOI: 10.30970/cma11.0375

Binary Phase Diagrams



DOI: 10.1361/105497100770340525

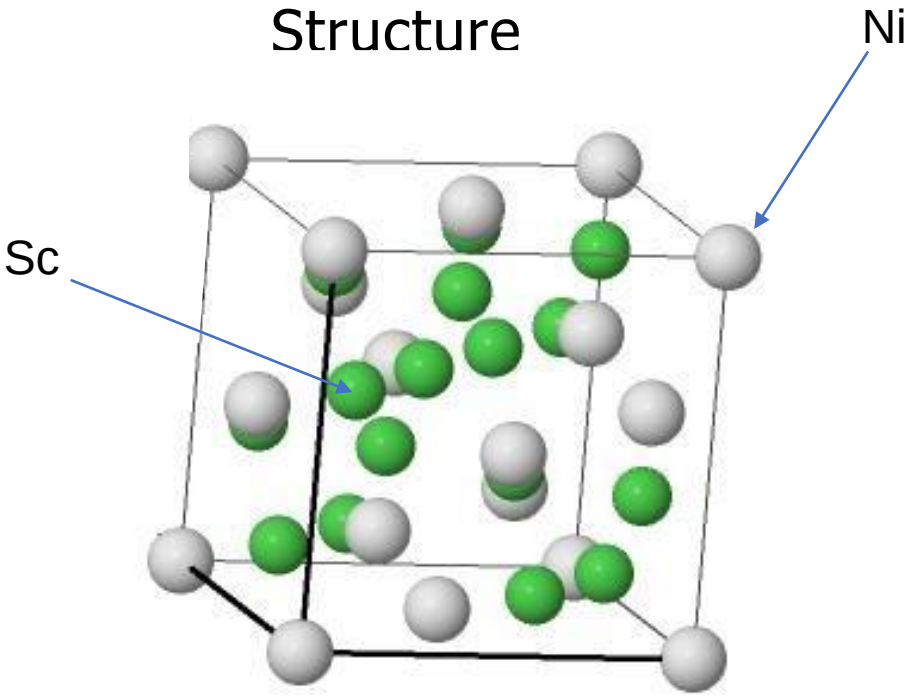
Results for Sc_2Ni_7



$ScNi_2$ and YNi_2

$ScNi_2$

- Paramagnetic
- Cubic Crystal Structure

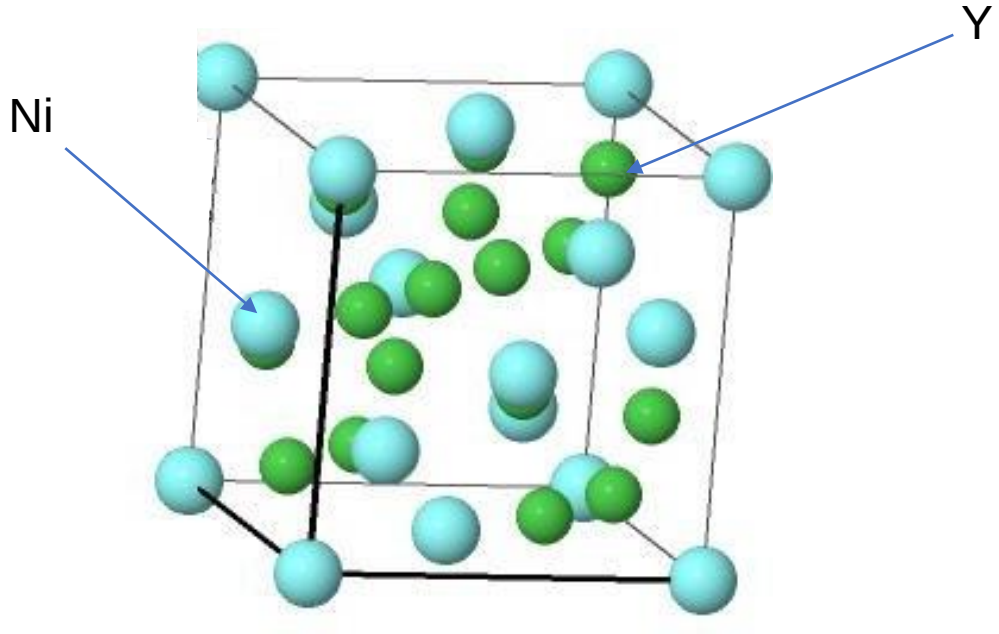


Citation: S.B. Maslenkov, G.S. Braslavskaya, *Izvestiya Akademii Nauk SSSR, Metally*, 1984, 1984, 203

Goal: learn what Y-Sc substitution does to the paramagnetic state in $ScNi_2$

YNi_2

- Cubic Crystal Structure



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Thanks

People from left to right:

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