**MM 226-Assignment 1 Report**

**Group 5: Co, Co-Ni Based Alloys.**

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**1. Overview of Resources Used**

The following sources such as Special Metals Corporation (Link) for Manufacturer Datasheets, ASM International and ASM Specialty Handbooks, Research Articles and Technical Reports were used for collection of data. These sources provided **Mechanical Properties, Microstructural Information, Processing History, and Metadata** for 20 selected Co/Co-Ni-based alloys. To optimize the search process and reduce time, tools like Perplexity AI, ChatGpT and Google were also utilized for quick information retrieval and refinement.

**2. Comments on Data Collection**

**Types of Data Collected**

Mechanical Properties:Yield Strength (MPa), Ultimate Tensile Strength (UTS in MPa), Hardness (HRC/HRB), Elongation (%), Test Temperature (°C), and Strain Rate (s⁻¹).

Example: UNS R30003 (Elgiloy) has a yield strength of 480 MPa, UTS of 970 MPa, hardness of 97 HRB, elongation of 25%, tested at 25°C with a strain rate of 0.001 s⁻¹.

Microstructural Information:Grain size (e.g., Stellite6: 5–20 µm) and phases at room temperature (e.g., γ-Co matrix with carbides).

Processing History: Method Annealing, Casting, and Cold-Hot metal forming methods were identified for various alloys. Example: Haynes 25 (L605) undergoes hot forging followed by solution annealing at 1200°C for 1 hour. Metadata:Source citations, test conditions, and processing methods were documented for each alloy. **Missing Data and Gaps Identified**

A. EN Numbers: Standardized EN designations were unavailable for some alloys like Tribaloy T-400, FSX-414,etc. Grain size and Phase reported: The grain size and phases of certain alloys like UNS R30075 were missing and not provided in the literature.

B. Hardness Values: Hardness data was missing or inconsistent for certain alloys like UMCo-50 and WI-52, and were filled using google search.

C. Strain Rate and Test Temp: All strain rates were assumed to be 0.001 s⁻¹ and test temperatures as 25°C (Room temperature) due to a lack of experimental validation in the sources provided.

**3. Recommendations**

Filling Data Gaps:

Using computational tools like Thermo-Calc TCNI12 to predict and validate microstructural data.Perform hardness testing using ASTM E18 for alloys with missing values.

Data Validation:Cross-check mechanical properties with additional experimental studies to ensure consistency. Future Work:Extend the dataset by including test data at elevated temperatures or different strain rates to capture broader material behavior.

This report summarizes the data curation process for **Co/Co-Ni-based alloys**, highlighting both the strengths of the collected data and areas requiring further investigation or validation. The Atomic fraction data was oftenly missing in the literature and was converted from weight fraction via implementing a **Python code.**

**4. Contribution**

Shaksham: Collected data of the Alloys Majorly mechanical properties and weight fraction related and compiled all data; wrote and implemented the Python code.

Reyaz: Collected data of the Alloys Majorly related to the Microstructure; refined the dataset and authored this report. Link: MM226\_Assignment\_1\_Group\_5

The link contains the .py (and .ipynb) file which were used to generate .json files from the given .csv files.