**Machine Learning Techniques for Predicting the Properties of Ceramic Products**

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Abstract

Ceramic products are essential in various industries such as electronics, aerospace and construction due to their diverse physical properties.

However, obtaining a final product with specific physical properties such as mechanical resistance or water absorption is a challenging task due to the complex interactions between raw materials, often leading to extensive and costly laboratory testing.

In this project, we aim to reduce the trial-and-error nature of ceramic formulation by using machine learning (ML) to predict the final properties of the product based on the properties of the raw materials used on their composition.

To achieve this, we used a dataset comprising 230 past ceramic formulations, each containing 7 raw materials. Each raw material is described by 11, features for a total of 77 features. Instead of having 11 targets, we chose to have only 4, since the remaining ones can be extrapolated. This was done to reduce the complexity of the problem [1,2].

We used 2 supervised ML models: linear regression (LR) and neural networks (NN).

Despite the poor predictions obtained with LR (R² = -3.15, MAE = 0.55), NN achieved significantly better results (R² = 0.98, MAE = 0.69), demonstrating that it can be used to reduce the costs of laboratory testing and streamline the production of ceramic products [1,2].

Keywords

Ceramic materials, Machine learning, Property prediction, Neural networks, Supervised learning

References

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