RARA Factory: an Experiment-first AI Platform for the Discovery of Novel Sustainable Materials

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The scarcity and criticality of key elements, from rare earths to other strategic raw materials, pose a structural challenge to the energy transition and to high-technology supply chains. I will present RARA Factory, a company founded as a spin-off of Ca' Foscari University of Venice, whose goal is the discovery, development and prototyping of novel materials that are cheaper and more sustainable than the existing ones, built from abundant elements. Rather than a single-product effort, RARA is a general materials-discovery platform: a proprietary AI framework, developed in-house and not based on large language models, works in a closed loop with experimental synthesis and characterization.

Candidate compounds are proposed, synthesized and characterized, and the results are fed back to the model, progressively refining the search across compositions and functionalities. As a first demonstration of the approach, I will focus on the search for rare-earth-free permanent magnets, a case where purely computational screening seems to have so far failed to deliver viable candidates. To date, we have synthesized and characterized more than 30,000 materials and already identified hundreds of novel magnetic formulations, some of which we are currently patenting and whose nominal properties are industrially relevant. I will discuss the approach underlying the platform, the current status, and the perspectives of this experiment-first paradigm for materials discovery at large.