



TMS2022 PLENARY DISCUSSES ALLOY DESIGN AT APPLE; HIGHLIGHTS TMS CONNECTIONS

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—Ellen Cerreta

“Jim’s story is a TMS story,” said Ellen Cerreta, 2021 TMS President, as she introduced Jim Yurko, the all-conference plenary speaker at the TMS 2022 Annual Meeting & Exhibition (TMS2022). Yurko is senior distinguished engineer at Apple Materials Engineering and has an extensive history of involvement in TMS.

His plenary talk, “Alloy Design at Apple,” discussed the role that materials play in making Apple products a reality and in reducing the company’s environmental footprint. But it also told the story of how Yurko and his team found solutions to pressing design and sustainability issues with the help of collaborators they met through organizations like TMS.

At the outset of the TMS2022 plenary, delivered on March 1 in Anaheim, California, Yurko promised he’d do his best to deliver a cross-cutting presentation that would appeal to audience members whose interests spanned all five TMS technical divisions.

In his current role, leading the Alloy Engineering Team at Apple, Yurko and his group are responsible for alloy design and engineered surface development of all Apple products. But when he started his career, he told the audience, he was part of the TMS Extraction & Processing Division. In discussing his work with Apple, Yurko talked about topics ranging from functional thin films and integrated computational materials engineering (ICME) to alloy design and metal manufacturing.

Above: Jim Yurko engaged a full, yet socially distanced, crowd with an overview of the work his team at Apple is doing in his plenary presentation. Below: Ellen Cerreta, 2021 TMS President, presents Jim Yurko with a coin commemorating the return to the in-person TMS Annual Meeting, in recognition of his role as TMS2022 Plenary Speaker.



Alloy Development at Apple

At Apple, Yurko and his team face a number of materials design challenges that require fast solutions. This sometimes means introducing new materials (developing, testing, and qualifying) in the timespan of a year or less.

"We're developing materials for products at such an amazing pace and at a scale that's really mind boggling, when you think about more than 1.8 billion active devices," said Yurko.

Ten years ago, Apple made a decision to further enhance its materials development capabilities. The decision was made to build a dedicated Alloy Engineering Team with a foundation in computational and system alloy design. "What seems intuitive now as the way to design materials was pretty groundbreaking ten years ago," said Yurko, explaining that the system design approach relates performance to properties to structure to process.

Yurko highlighted his group's ICME tools and the development of new approaches to expand their materials development capabilities. He pointed out that a number of people sitting in the audience at TMS2022 were part of the research community that is helping Apple to find these solutions.

"I really want to emphasize to the industry folks in the crowd: TMS is an amazing resource for collaboration," he said. "It is a one-stop shop where you can work with people in this large materials research community and develop what is needed in a mutually beneficial relationship."

To illustrate how Apple is able to use some of the tools it has acquired over the years, Yurko highlighted the rapid development of a new, high-strength 6000-series aluminum, a high-strength and non-magnetic stainless steel for iPhone X, and new PVD colors on iPhone Pro.

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—Jim Yurko

Sourcing Sustainable Materials

Yurko ended his talk with a look at how Apple is working to meet its environmental goals of creating products that will be net carbon zero and made from 100% recycled or renewable materials by 2030. It's a massive materials challenge, but he shared a story that showed how partnerships can help them reach those goals.

One significant way the company is reducing its carbon footprint is through aluminum. Apple uses recycled aluminum for their products when possible and sources primary aluminum from smelters that use renewable, rather than coal-fired, energy sources.

Apple wanted to help the aluminum industry with their push towards carbon-free smelting, and Yurko shared the story of how they assisted with the formation of Elysis, the Rio Tinto and Alcoa joint venture. Yurko went on to describe the TMS connections to this project, especially with 2017 TMS President Dave DeYoung. In 2018, Elysis was launched and Apple bought some of the company's first aluminum to meet commercial purity for use in the MacBook Pro. Since Yurko's talk at TMS2022, Apple has announced it is using Elysis aluminum in the production of the iPhone SE.

"I want the research community to know that we are looking for engagement with you," Yurko told the audience. "We want to apply what you're developing into our products. I'm reaching out to all the people in industry who want to work with us to make our products more environmentally sound and higher performing."

Yurko (center, in blue) and his Alloy Engineering Team from Apple take the stage following the TMS2022 Plenary.

