U.S. DEPARTMENT OF ENERGY
Office of Science

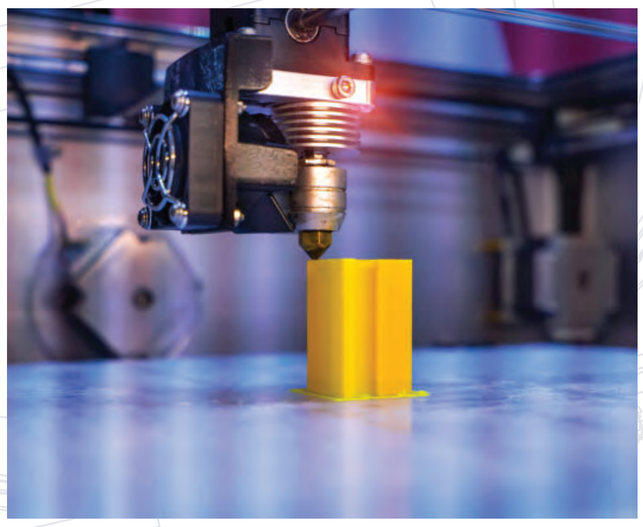
Argonne NATIONAL LABORATORY

INDUSTRIAL MATERIALS AND THE ADVANCED PHOTON SOURCE

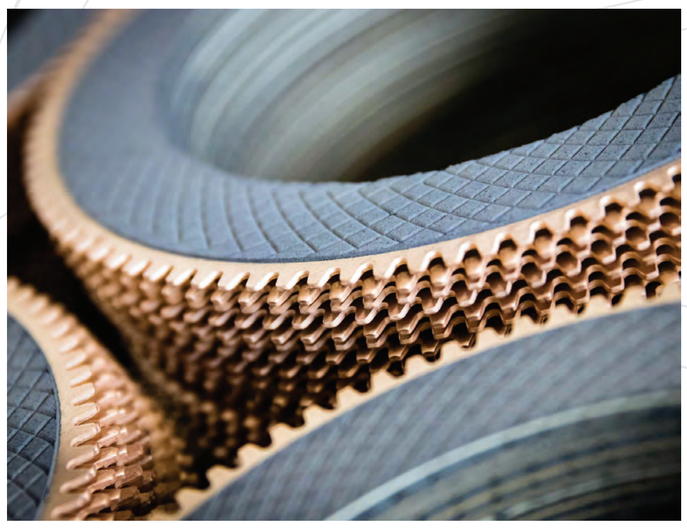
The U.S. Department of Energy's Advanced Photon Source (APS) at Argonne National Laboratory enables research that enriches our knowledge of the world around us while driving innovation that generates new products, builds new industries, and creates new, good jobs by fostering advances in manufacturing, information- and nanotechnology, pharmaceuticals, biomedicine, oil and gas, transportation, agriculture, and many other areas critical to our technologies, security, and economy.

Enancing Additive Manufacturing

Additive manufacturing (AM) is becoming more important in many industries, and has been the subject of many experiments by users of the APS. One study showed that integrating a cold-spray coating process offers a way to overcome the fragility and reduced structural integrity of some AM-fabricated products and further increase the versatility of additive manufacturing techniques.



Additive manufacturing set-up. ©2021 Advanced Technology Services, Inc.



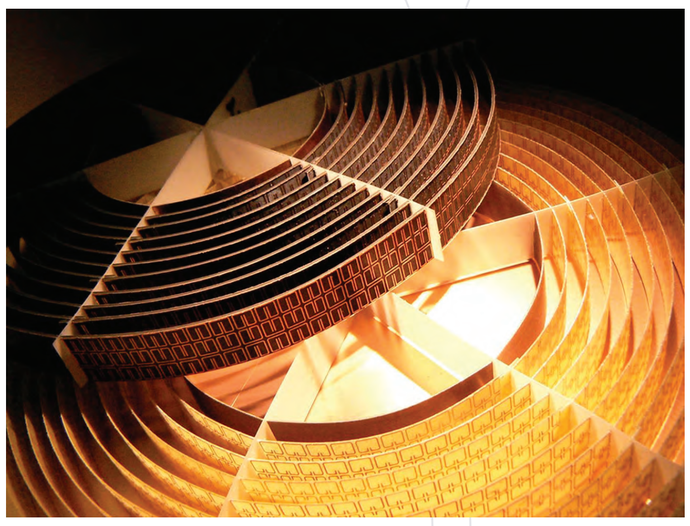
Sintered bronze wet-disc brakes. Copyright @ 2021 | GMP Friction Products

Better Materials Control

Sintering (coalescing a powdered material into a solid or porous mass by heating it; usually also compressing it without liquefaction) produces unique materials with unusual properties. Researchers used the APS to determine the factors behind the high strength of very-fine-grained sintered metals and thus improve our understanding of these metals that should result in improved control of their properties for end-use parts.

Metamaterials Built to Order

Researchers developed a groundbreaking one-step process for creating metamaterials with unique properties based in large part on experiments carried out at the APS. Their results show the realistic possibility of designing self-assembled structures with the potential of creating "built-to-order" nanostructures for wide applications in electronics and optical devices.



Metamaterial cloaks can hide objects from bands of microwave radiation. Image courtesy of David Schurig. Copyright © 2021 National Academy of Sciences.

Shedding Light on Protective Ceramic Coatings for Engine Blades

Accelerated development of more energy-efficient, longer-lasting turbine blades for aircraft engines (left), and similarly enhanced blades for industrial gas turbines, was the subject of groundbreaking research at the APS that employed accurate laboratory simulations of extreme conditions (temperature gradients and mechanical loadings) experienced by ceramic-coated, super-alloy blades within turbine engines.

Scan this QR code for a complete list of APS science highlights.

This research used resources of the Advanced Photon Source, a U.S. Department of Energy (DOE) Office of Science User Facility operated for the DOE Office of Science by Argonne National Laboratory under Contract No. DE-AC02-06CH11357.

www.anl.gov • www.aps.anl.gov • apsinfo@aps.anl.gov