

An Innovative Ceramics Compaction Technology using Nano-Fracture of Fine Particles at Room Temperature

—Ultimate ceramics processing, toward super ceramics—

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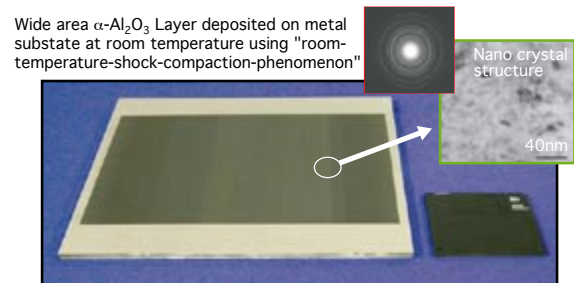
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The Advanced Manufacturing Research Institute (AMRI) of the National Institute of Advanced Industrial Science and Technology (AIST) successfully consolidate α - Al_2O_3 fine powder on the metal substrate at room temperature without binder and firing, for forming the ceramic thick layer, using Aerosol Deposition (AD) method.

It was discovered that the materials particles were fractured and deformed into 10 to 30 nm nano-crystallite size particles during the impact with the substrate. As the result of fracture, the activation of newly formed particles surfaces was occurred stimulating the inter-particle bonding and resulting the formation of very dense nano-crystal structure. Uniform deposition on metal substrate over a 200 mm square area was achieved. α - Al_2O_3 thick layer has fine mechanical and electrical properties as same as that of the

bulk sintered material.

This process represents a technological breakthrough, in as much as wide ranging applications are anticipated, such as the use of moderately priced raw material particles, currently used for ceramic processing, to form nano-structured ceramic films, although the conventional sintering process of over 1000°C is not required while achieving the hardness and density equal to ceramics sintered in bulk at high temperatures.



Wide area α - Al_2O_3 Layer deposited on metal substrate at room temperature using "room-temperature-shock-compaction-phenomenon"

α - Al_2O_3 layer and its microstructure formed at room temperature by AD method

Mechanical Engineering and Manufacturing Technology

RT Middleware - Robot Technology for the Made-to-Order Business Model

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As a potential application of RT middleware technology, we developed a robot system for supporting daily life activities (RT space) and demonstrated various made-to-order robot services.

In the project, we have carried out research and development regarding the software, which helps the efficient development of robot systems. We studied the standard specifications of the robot middleware, which promotes modularization. We also developed a prototype middleware. Finally, we proved the effectiveness of middleware technology on typical robot system construction examples.

We would like to disseminate the use

of this open robot system architecture and make a contribution to industrial technology and the economy.



Living room incorporating robot technologies for supporting daily life activities (RT-space)