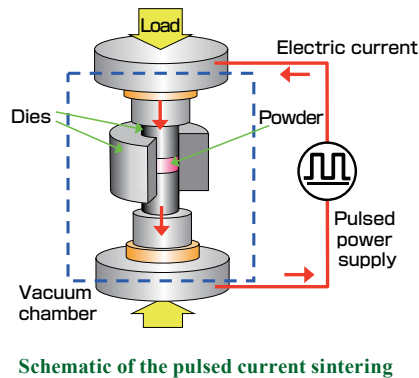


High-performance isotropic sintered magnets without addition of dysprosium

Contribution to resolution of resource problem in high-performance magnets by advanced sintering technique

We have developed dysprosium (Dy)-free hard magnets with high performance. The developed magnets were produced from compound powders of samarium (Sm), iron (Fe), and nitrogen (N). The key technique for our achievement was a pulsed current sintering with an optimum control of powder compaction. This technique was able to consolidate the poor-sinterable Sm-Fe-N powders into the bulk magnets with relatively high density of more than 90 %. The obtained Sm-Fe-N magnets exhibited the world's highest level of maximum energy product as an isotropic magnet, 129 kJ/m³ (16.2 MGOe). Expanding eco-friendly industries such as hybrid/electric vehicles are demanding further supply of high-performance bulk magnets for electric motors, which currently depends on Dy-added neodymium magnets. The developed hard magnets must contribute to resolution for the resource problem of Dy.



Developed Sm-Fe-N sintered magnet without heavy rare earth
High-performance magnets attract 40 of 4-g iron balls.

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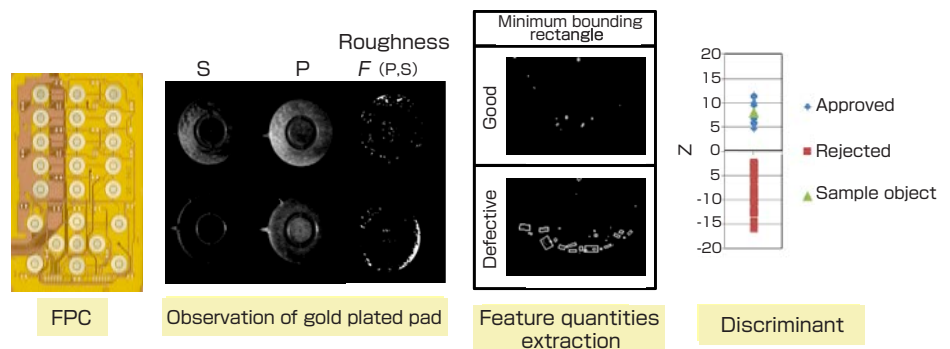
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Metrology and Measurement Science

Compact inspection apparatus for nonuniformity in the luster of gold plating

Digitization of nonuniformity in the luster of gold plating and automatic acceptance recognition based on objective criteria

A versatile compact inspection system has been developed to enable automatic recognition of nonuniformity in the luster of gold plating through measurement of the surface of a flexible printed circuit board (FPC). The system has two main processes. The first process involves imaging by polarization analysis to determine the distribution of the surface roughness of the gold plating that causes the nonuniformity. The other involves the quantification of the nonuniformity in the luster through calculation of the discriminant function, which is obtained using shape feature-quantity computations and statistical methods. The evaluation criteria are created through learning of the teacher data for normal and abnormal products. These criteria can be aligned easily with different boundary samples for each product. Currently, through the verification of actual samples, we are attempting to standardize the testing methods.



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