Spontaneous Materials

April 2002

There were several interesting questions after my presentation at Intertech, which I have tried to duplicate below. While the questions are essentially quoted verbatim, the answers here are a bit fuller than the answers I gave at the conference, since I'm able to link to resources that were not available when I made the presentation.

Dr. Bhanu Cheluri, IAP research, Inc., Dayton, OH, USA

Q What is the relative abundance of neo ores in India as compared to China?

A This subject is well covered by the United States Geological Survey. A specialist named Jim Hedrick covers rare earths and writes an annual report. (click here for his latest report) In terms of reserves, the Indian deposits are about 2% the size of the Chinese deposits. In terms of quantities mined, Indian production is about 3% of Chinese production for the years 2000 and 2001.

Q If low cost labor is a significant factor, will India become a significant factor magnet producer/supplier for the world market in the near future?

A From the stand point of raw materials, two things stand in the way. First the Indian deposits are mainly monazite. Unlike the Chinese ores which are primarily bastnasite, monazite contains radioactive thorium, which must be removed early in the process and handled appropriately. Second, the Chinese Government made developing the rare earth industry a high priority early in their industrialization. India could make this a priority and it has ample resources to become a player in this market.

Dr. H. Harada, Hi Tech Association, Fukaya, Japan

Q Dysprosium is used to increase the coercivity of NdFeB magnets. Right now there is an excess of dysprosium, but could there be a shortage if we make more magnets for high temperature applications containing more dysprosium?

A If we just consider the Baotou mine for a moment, the ore contains 18.5% Nd and 0.1% Dy. That means for every 100 kg of Nd, just 0.54 kg of Dy could be produced. Assume the following scenario for the uses of Nd, half is used for electronics, one-quarter is for magnets without Dy and one-quarter is used for magnets with Dy. That leaves 25 kg of Nd with 0.54 kg of Dy. In terms of alloy composition, that would be a Dy content of about 0.6%.

However, some NdFeB alloys use as much as 4% Dy to achieve high coercivity. Part of this shortfall could be covered by the ionic clay ores and others, which contain more Dy, several percent in some cases. But these ores are limited.

So yes, it seems likely that there could be a shortage of Dy, should alloys with more than 0.6% Dy become popular.

Dr. Bao-Min Ma, Magnequench, Inc., RTP, NC, USA

Q If $SmFeN_x$ becomes popular, could that affect Sm pricing?

A Yes. I might turn the question around, there seems to be a natural limit to the $SmFeN_x$ market in terms of the NdFeB market. If we do an analysis similar to the last question. The Baotou ore has 18.5% Nd and 0.8% Sm. I'll assume again that half the Nd is available for magnets. For the Sm, let's say that one-quarter of the Sm is used in SmCo magnets and the rest is available for $SmFeN_x$ magnets. Crunching through the numbers gives us 8.6 kg of $SmFeN_x$ for every 100 kg of NdFeB. This is probably a worst case scenario since other ores have more Sm, but are less abundant. This means that if the $SmFeN_x$ market exceeds 8 to 12% of the NdFeB market, based on weight, I would expect the Sm price to increase as its available is tightened.

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