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Preparation of rare earth sintered permanent magnets in atmospheric air using Terpineol as a protective liquid agent

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A straightforward method for the production of rare earth permanent magnets have been successfully developed in this investigation. Compulsory, a standard glove box with a protective atmosphere must be used during the transference of the highly reactive fine milled hydride powder to the rubber tube used for isostatic pressing. A glove box, which can be routinely operated at oxygen levels below 30 ppm, has considerable capital, operational and maintenance cost. In the present processing route no glove box has been employed. After hydrogen decrepitation, the magnetic Pr20Fe73B5Cu2 alloy in the as-cast state has been milled to a fine powder using terpineol as the milling liquid. Ball milling has been carried out for 22 hours and the fine powder was partially dried in vacuum at 70oC. Protected by the remaining terpineol the fine powder has been placed in the isostatic tube without a protective glove box, i.e., exposed to the atmospheric air moisture (oxygen plus water vapor). The isostatically pressed green body has been sintered at 1050oC for 1 hour employing a high vacuum (10-6 mbar) turbomolecular pump. Slow cooling in the furnace has been employed to optimized the sintered magnet performance. Magnetic properties were measured in a closed loop permeameter after magnet saturation by capacitive discharge in a 6 tesla pulse field. Good magnetic properties have been obtained with this practical and economical processing route of rare earth permanent sintered magnets.