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Rock magnetism and magnetic fabrics of impact polymictic breccias and melt from the Chicxulub crater, Mexico

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Impact polymictic breccias are highly heterogeneous materials. As part of our studies of the Chicxulub crater impact lithologies, we have studied the magnetic properties and magnetic fabrics of the impact breccias and melt. The breccias are formed by clasts of melt, limestone and basement rocks within a carbonate-rich or melt-rich matrix. Chicxulub is a large 200 km diameter complex multi-ring structure formed in the Yucatan carbonate platform at the Cretaceous/Tertiary K/T boundary. Here we concentrate on the rock magnetic properties (hysteresis, IRM, thermomagnetic curves, NRM, AF and thermal demagnetization of NRM and saturation IRM) and anisotropy of magnetic susceptibility (AMS) of impact breccias and melt. We study the effects of shock, heating/pressure, shattering, fragmentation and hydrothermalism in the impact generated lithologies. In particular, we investigate effects of laboratory heating on the magnetic properties and AMS (including potential use of heating in component separation of composite fabrics and in enhancing magnetic fabrics). Breccia samples are recovered from cores from the Santa Elena borehole, which was drilled in the southern sector of the crater at about 115 km radial distance from the crater center at Chicxulub Puerto. The impact breccia sequence at Santa Elena lies at about 795-895 m depth, and is conformed by six subunits: (1) re-deposited melt-rich, clast-size sorted, fine-grained suevites, (2) melt-rich, no clast-size-sorting, medium grained suevite, (3) coarse suevitic melt agglomerate, (4) coarse melt-rich heterogeneous suevite, (5) brecciated suevite, and (6) very coarse, carbonate and silicate melt suevite. Chicx-

ulub breccias present carbonate-rich and melt-rich matrix, with clasts from a large range of lithologies from the Yucatan basement units and melt material. Main magnetic carriers of remanent magnetization in the breccias are magnetite, low-titanium titanomagnetites and hematite. Melt samples come from the Yucatan-6 and Chicxulub-1 boreholes located closer to the crater center. Melt samples are characterized by a reverse polarity magnetization, likely of thermoremanent origin and residing in fine-grained PSD titanomagnetites and magnetite. In general, study of the anisotropic properties of magnetic susceptibility and remanent magnetizations of impact lithologies has received relatively little attention in paleomagnetic research. These studies have implications for the cratering processes, generation and deposition of breccias, and hydrothermal metamorphism. Mineralogical changes resulting from heating samples have been recognized, but no data on impact lithologies including breccias and melt rocks have been reported. Use of temperature induced effects to investigate composite magnetic fabrics in heterogeneous materials such as the impact breccias is discussed.