Magnetic Fabric: A Tool for Ore Resource Exploration

LI Guangrong^{1,2,*}, GUO Fusheng¹ and WU Changzhi²

¹ State Key Laboratory of Nuclear Resource and Environment, East China University of Technology, Nanchang 330013, China

² State Key Laboratory for Mineral Deposits Research, Nanjing University, Nanjing 210093, Jiangsu, China

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Abstracts: The earliest study of magnetic fabric (also called Anisotropy of Magnetic Susceptibility) probably can be traced back to 1942 when Ising wrote magnetic properties of Carved Clay (Ising, 1942). And then in November 1954, John Graham published an abstract for the annual meeting of the Geological Society of America with the title of "Magnetic susceptibility anisotropy, an unexploited petrofabric element". After more than sixty years study, it seems come to reach a consensus that: magnetic fabric could be used as a tool for mineral exploration in addition to the fundamental geological research. Herein, two examples are introduced from the Yamansu iron ore deposit and Xiangshan uranium ore deposit from the Xinjiang and Jiangxi, respectively.

(1) Tracing the fluid flow in the Yamansu iron deposit

In Yamansu iron deposit, the bodies are located within astrikeslip fault zone of several hundred meters wide and 5km long. In addition, the ore bodies are nearly W-E extend with angle about 60° , which lead enterprises blindly drill along the strike-slip fault zone near the Yamansu mining area for more ore resource. AMS study showed that most of the magnetic foliation and lineation are horizontal and a few are inclined after bedding correction. Horizontal magnetic fabric reflects that iron-bearing hydrothermal fluid flowed horizontally, while inclined magnetic surface and magnetic lineation were likely to be affected by later tectonics after emplacement of the ore shoot and skarnization because of their high anisotropy degree (> 1.2). The hanging wall rock (massive garnet) and foot wall rock (basalt) were also horizontal. It means the Permain dextralstrike-slip titled the formations to a positive flower structure. In other words, it is difficult to find concealedskarn-type iron deposits nearby that along the fault.

(2) Identify the volcanic calderas from Xiangshan uranium ore field

As the world's third largest volcanic type uranium ore field, Xiangshanvolcanic basin attracted scientific research as well as large amount ofindustry investment. Previews drill prospecting illustrated that uranium polymetallic mineralization which reaches 1000 meters-deep was yielded in the seemly volcanic caldera. However, the result of gravity inversion gave not much information on the sub-scale volcanic calderas expect the biggest one called Xiangshan peak. Magnetotelluric sounding was also conducted in the whole basin, it did indicate some volcaniccalderas but it seems ambiguous. Magnetic fabric results help to clarify thesevolcaniccalderas, although there are some inconsistencies between them.

Key words: anisotropy of magnetic susceptibility, iron fluid, uranium deposit, volcanic calderas

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About the first author

LI Guangrong, PhD, mainly engaged in magnetic fabric study and magnetite fine structure. TEL: 15350001779. Email: liguangrong0086@ecit.edu.cn

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^{*} Corresponding author. E-mail: liguangrong0086@ecit.edu.cn