The use of sinter in mineral exploration: a case study from the Ohakuri gold prospect, Taupō Volcanic Zone, New Zealand

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ABSTRACT

Mineral exploration in low-sulfidation epithermal systems requires integration of data from a range of methods to identify potential sites of mineralisation in the subsurface. Among these methods, is the use of siliceous sinter to identify the former paleo-surface and structural controls necessary for focusing fluids and producing ore-grade deposits. We present a comparative analysis of traditional and contemporary approaches for sinter analysis and interpretation, using the Ohakuri Au-Ag prospect as a case study. The site, considered the most promising prospect in the Taupō Volcanic Zone, has a long history of mineral exploration, resulting in more than 62 drill cores and 32 resource reports, yet ore-grade deposits remain elusive. Herein, we set out to determine the effectiveness with which sinter was utilised in past efforts and identify potential areas of improvement. Thus, we analysed more than 200 new samples, along with all previously reported sinter, using a contemporary approach based on a lithofacies framework of hot spring deposits. We then compared the results of sinter identified through traditional and contemporary methods and their usefulness for informing exploration strategies. Our results indicate that earlier approaches led to large inconsistencies in mapped distributions of sinter and conflicting accounts regarding the relationship between sinter and fluid movement in the system. Using the lithofacies approach, we determine that Ohakuri sinter formed through near-neutral, low gas, alkali-chloride fluids, produced following boiling in the subsurface during ascent along fluid-focusing structural controls. Sinter identified and understood through earlier approaches was of little use in exploration strategies. Sinter identified and understood through a lithofacies framework allows for unambiguous reconstruction of the paleoenvironment and discrimination of upflow zones. This information can be ascertained and integrated with geophysical data prior to commencement of expensive drilling operations, leading to reduced costs and improved efficiency in mineral exploration.