

Silica monitoring at the Hellisheidi power plant for the mitigation of amorphous silica scaling

F. BERRO JIMÉNEZ¹, M. LELLI², I. MINARDI¹,
I. GUNNARSSON³ AND L. MARINI⁴

¹West Systems S.r.l. www.westsystems.com (correspondence: f.berro@westsystems.com)

²CNR-IGG, Via Moruzzi 1, I-56124, Pisa, Italy

³Reykjavik Energy, Baejarhalsi 1, Reykjavik, 110, Iceland

⁴www.appliedgeochemistry.it

Hellisheidi is the biggest geothermal power plant in Iceland with a total net capacity of 303 MW electric and 133 MW thermal [1].

Reservoir temperature varies between 250 and 320°C [2] and silica concentration in reservoir liquids is expected to be higher than ~500 ppm, assuming saturation with quartz. Monomeric silica concentration attains ~700-800 ppm in the separated liquids [2]. These are cooled to 50°C, causing silica precipitation in pipelines and other surface equipment [2].

Simulations of the kinetics of amorphous silica precipitation carried out by means of the SILNUC code [3] upon its refurbishing [4] indicate that ~200 mg SiO₂/kg water may be precipitated in a period of 60 minutes. Observed silica scaling rates are much lower than those predicted by SILNUC.

To obtain further insights on this matter, silica concentration has been monitored in the geothermal liquids of the Hellisheidi power plant using the automatic instrument described in the companion communication [5]. The obtained results are presented and discussed in this communication.

Further experiments are foreseen to monitor the dissolved silica in the laboratory experiments carried out in mixed-flow reactors for determining the dissolution rate of silicate minerals and rocks. In this case it is necessary to measure the absorbance of the blue-colored silicomolybdate complex. Thus dilution and suppression of sulfide interference [6] are no longer required.

Acknowledgement: This research was supported by the MINSC Marie Curie Initial Training Network.

[1] Gunnarsson I. *et al.* (2011) *SGP-TR-191*. [2] Gunnarsson I. *et al.* (2010) *Proceedings W. G. C. 2010* [3] Weres *et al.* (1980) *Kinetics of silica polymerization*. Report LBL 7033. [4] Berro Jiménez *et al.* (2013) *Min. Mag.*, **77(5)**, 694. [5] Berro Jiménez *et al.* (2015) *Min. Mag.*, this volume. [6] Berro Jiménez *et al.* (2014) *Min. Mag.*, **78(6)**, 1417-1422.