

The concept of end of waste in view of developing sustainable secondary geo-materials

A.F. GUALTIERI^{1*}, A. VIANI² AND S. POLLASTRI¹

¹Dipartimento di Scienze Chimiche e Geologiche, Università di Modena e Reggio Emilia, 41121 Modena, Italy

(*correspondence: alessandro.gualtieri@unimore.it)

²Institute of Theoretical and Applied Mechanics AS, Prague and Centrum Excellence Telč, 588024 Czech Republic.

The concept of *end of waste*, adopted by the European Commission on December 2005, regards under which conditions a waste could cease to be waste and could be regarded as a non-waste material. This is a revolutionary way to think of wastes not just as refuse to be dismissed but as secondary raw material to be exploited, with an enormous social and economic impact. In this scenario, the creativity of *materials* scientists is highly stimulated and the key to success is the development of innovative and sustainable means to transform a waste into a secondary raw material of potential economic value. To this aim, stimulus comes from the so called *geo-inspiring materials*. This contribution presents the results of a long-term project aimed to recycle asbestos containing materials (ACMs), into secondary raw materials for various industrial applications. The high temperature product of transformation of ACM can be successfully recycled in clay bricks, rock-wool, glass-ceramics, ceramic pigments [1], geopolymers [2], concrete [3], and recently also for innovative formulations of calcium sulfoaluminate cement clinkers [4] and magnesium phosphate cements [5].

[1] Gualtieri *et al.* (2011) *Waste Man.* **31**, 91–100. [2] Gualtieri *et al.* (2012) *Constr. and Buil. Mat.* **31**, 47-51. [3] Gualtieri & Boccaletti (2011) *Constr. and Buil. Mat.* **25**, 3561–3569. [4] Viani & Gualtieri (2013) *J. Hazard. Mat.* Accepted. [5] Viani & Gualtieri (2013) *Cem. Concr. Res.* Submitted.

Mapping the natural radioactivity of Elba Island by means of geostatistical interpolation of airborne gamma-ray data

GUASTALDI E.¹, BALDONCINI M.³, BEZZON G. P.⁴, BROGGINI C.², BUSO G. P.⁴, CACIOLLI A.², CALLEGARI I.¹, COLONNA T.¹, FIORENTINI G.⁵, KAÇELI XHIXHA M.⁵, MANTOVANI F.³, MASSA G.¹, MENEGAZZO R.², MOU L.⁴, ROSSI ALVAREZ C.², STRATI V.³ AND XHIXHA G.⁴

¹CGT Center for GeoTechnologies, University of Siena, Via Vetri Vecchi, 34 - 52027 S. Giovanni Valdarno, Italy. (guastaldi@unisi.it)

²Istituto Nazionale di Fisica Nucleare (INFN), Padova Section, Via Marzolo 8 - 35131 Padova, Italy. (carlo.broggini@pd.infn.it)

³Department of Physics and Earth Sciences, University of Ferrara, Via Saragat, 1 - 44100 Ferrara, Italy. ((mantovani@fe.infn.it)

⁴Istituto Nazionale di Fisica Nucleare (INFN), Legnaro National Laboratory, Via dell'Università, 2 - 35020 Legnaro, Padova, Italy. (giampaolo.buso@lnl.infn.it)

⁵Istituto Nazionale di Fisica Nucleare (INFN), Via Saragat, 1-44100 Ferrara, Italy (giovanni.fiorentini@fe.infn.it)

We present the maps of K, eU, and eTh radioelement abundances of Elba Island (Italy) realized by means of a geostatistical interpolation of airborne γ -ray data, performed with a module of four NaI(Tl) crystals of 16 L mounted on an autogyro. We applied the Collocated Cokriging (CCoK) multivariate estimator in a non-conventional way for interpolating the under-sampled airborne gamma-ray data using the geologic map as constraining ancillary variable. An arbitrary number has been assigned to each geological formation and used in the algorithm for estimating the radioelement abundances: the independence from the random assignment process has been tested for three distinct models. The spatial variability shows well-defined structures for the linear coregionalization models. The abundance maps indicate a distinct correlation between the geological formation and radioactivity content. High K, eU and eTh abundances were estimated in the intrusive granitic complex of Mt. Capanne and low abundances in the geological formations in the N-E sector of Elba Island. However, a clear anomaly of high K content in the Mt. Calamita promontory confirms the presence of felsic dykes and hydrothermal veins not reported in geological map of Tuscany Region at scale 1:10000. This result confirms that the internal variability of the radiometric data is not biased by the multivariate interpolation.