



Nucleation of particles on single glass fibers and metal transport within particles - a case study at a fumarole of La Fossa volcano, Vulcano island, Italy

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Filter experiments and subsequent FESEM/EDS analysis of particles collected on filters tested at the fumarole F0 (ca. 300°C, highly acidic), La Fossa volcano, Vulcano island, Italy reveal that single fibers of fibrous filters collect particles or trigger particle nucleation on fibers in a highly heterogeneous mode according to spatial distribution of nucleated particles. On individual fibers a great number of particles of the same chemical type can be found, with none of these particles present on neighbouring fibers. Sampling had been performed in 08-2004 (1) and 01-2005 (2) for four hours. Technical glass fibers of a +/- basaltic (RW-A1+B2; A=high density of fibers, B = low density of fibers) and a +/- high-Si rhyolitic composition (GW-1+2; low density of fibers) had been applied in a parallel mode by clogging the fumarole hole with them. RW-A1 showed patchy alteration phenomena of the glass. GW-1 collected cancrinite-group-like particles (diameter ca. 5 μm) scattered on many fibers. Their composition was analysed by EDS: C, O, Na[low], Mg[low], Al, Si, Cl, K[low], Ca[low]). Additionally Au, Ag and Pb are concentrated in regions within these particles. Available data do not indicate if these particles nucleated on the fibers or had been deposited. Typically, particles of one metal chloride are nucleating on one fiber or on two fibers attached to each other. Data comprise GW-1: Bi-Cl; GW-2: Mn-Cl, Pb-Cl; RW-A1: Pb-Cl; RW-B2: Tl-(Pb)-Cl, Pb-Cl. Time equivalent gas sampling (2) could have caused a contaminating Mn flux. Sulfides, mostly Pb-S and Bi-S nucleate in a scattered mode throughout the fibrous filter materials. These phenomena are still waiting for physical and chemical interpretation. However, preliminary data suggest that the nucleation of i.e. metal chloride particles on single fibers could be used to

detect changes of the element flux of F0. Further studies are necessary to evaluate if clogging of fumarole holes by glassy fibrous filter material could be used to reduce the flux of toxic elements to the environment.