Until now, alternative approaches used to interpret the anisotropy of magnetic susceptibility (AMS) of igneous rocks have focused on the influence of either very large mineral grains (whether magnetic or not) and on the small ferromagnetic minerals in a single domain state. As shown in this work, however, contributions from a population of ferromagnetic minerals of a submicroscopic size with super-paramagnetic behavior might be extremely important. The effect of the super-paramagnetic fraction is documented by studying the AMS, hysteresis and thermomagnetic curves of two sets of obsidians with contrasting bulk compositions. The cooling and deformation history of one of those obsidians is perfectly known, as these specimens were produced in the laboratory using material from a basaltic lava flow. The other samples are occurrences of a more silicic composition, and for which the AMS has been documented to have a close relationship with the distribution of microlites. The present results indicate that although the deformation and cooling histories of the lava might influence the exact composition of the ferromagnetic fraction, the relationship between the AMS and the deformation history does not seem to be altered. Furthermore, it is suggested that under certain circumstances the contribution from super-paramagnetic grains might be the origin of the AMS of igneous rocks that have an optically observable fraction of mineral grains, the latter contributing as noise. Consequently, a sounder interpretation of AMS fabrics would benefit from routine tests designed to identify the contribution of a super-paramagnetic fraction.