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**Strongly Size-Dependent High-Temperature Behavior of Bismuth Oxide Nanoparticles** GERRIT GUENTHER, Technische Universität Darmstadt, Materials Science, Petersenstr. 23, 64287 Darmstadt, Germany, RALF THEISSMANN, EINAR KRUIS, Nanostructures and Technology, University Duisburg-Essen, Bismarckstr. 81, 47057 Duisburg, Germany, OLIVIER GUILLON, Institute for Materials Science, Friedrich-Schiller-Universität Jena, Löbdergraben 32, 07743 Jena, Germany — Oxide nanostructures show very strong size-dependent changes in their thermal and chemical stability and reactivity. The degree of these changes depends on the type and strength of bonds at the surface: The higher the surface energy the stronger the size-dependence. Inorganic compounds are governed by strong and long ranging bonds which result e.g. in generally high melting points and surface energies. So the properties of such nanostructures could shed more light on the role that the material's surface plays. This is demonstrated here by experiments with size-selected bismuth oxide nanoparticles between 5 and 60 nm (±5%). Characterization of the particles revealed a metastable $\beta - Bi_2O_3$ structure. That testifies a size-driven crossover in phase stability below a critical particle size. Heating experiments up to the evaporation point were performed inside the synthesis-chamber as well as with in-situ TEM, in-situ XRD and a high-temperature nanocalorimeter. Different atmospheres were used. For the first time a melting point reduction in oxide nanoparticles was directly shown: For example 10 nm particles melted max. 40% and evaporated 12% below the bulk values which is a considerably stronger size-effect than for metals (≤5%).

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