SOLAR THERMAL AND CARBO-THERMAL PRODUCTION OF ZINC - SOLAR FURNACE EXPERIMENTATION

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Abstract - We describe experimental studies on the solar production of zinc by thermal dissociation of ZnO at above 2000 K, and by carbothermal reduction of ZnO at above 1200K, using CH_4 as reducing agent. Two prototype reactors were tested at PSI's high-flux solar furnace: a rotating cavity-receiver lined with ZnO particles was used for the thermal dissociation of ZnO, and a vortex-flow of ZnO particles and CH_4 confined to a cavity-receiver was used for the carbothermal reduction of ZnO. Both reactors feature either direct irradiation of reactants, or indirect irradiation using a graphite absorber. A third, alternative, solar reactor for the thermal dissociation of ZnO was also investigated. It consits of a 45 degree- inclined surface of ZnO particles directly exposed to the high-flux irradiation and having an aerodynamic curtain that protects the window from zinc condensation. The reactors' design and performance are presented.