

of the agitation markedly influences the steelmaking operation. In this work, two separate consequences of gas bubble agitation *viz.* homogenisation of the bath and removal of dissolved oxygen, both of which are important to steelmakers, were studied. While the extent of homogenisation was investigated in a cold model set up, the variation in dissolved oxygen levels in the bath was determined in laboratory as well as in operating steel-making furnaces. It was concluded that for identical volumes of gas injected into the bath, dispersed bubble agitation results in a distinctly shorter time of mixing than agitation induced by gas introduction through a single basal tuyere. The oxygen level of an un-deoxidised bath was found to decrease sharply at first and then increase gradually following agitation and a theoretical model was developed to explain this variation.

#### Mechanism of Dust Generation in a Converter with Minimum Slag

By Ryoji TSUJINO *et al.*

上底吹き転炉におけるダストの発生挙動を調査し、ダスト発生機構について検討した結果、次のことがわかった。

(1) 転炉ダストはバブルバースト粒子にヒュームが凝縮合体して生成される。

(2) ダスト発生に占めるバブルバースト比率は吹錬初期に高く、吹錬時間とともに低下し吹錬末期にはヒューム比率が増加する。したがってダスト低減対策としては吹錬初期の早期スラグ生成、吹錬中期からの火点冷却が有効と考えられる。

#### Dephosphorisation of Iron-Chrome Alloy with Ca-CaF<sub>2</sub> Melt during Electro Slag Refining

By Animesh JHA *et al.*

Calcium-calcium fluoride melt was used to remove phosphorus from the ferro-chrome alloy (64.5 wt% Cr, 0.15 wt% P) during electro slag refining process. The effect of atmosphere and deoxidisers, *viz.* Al, Fe-Mo, and misch metal were also studied during dephosphorisation reaction. The thermodynamic properties of Ca-CaF<sub>2</sub> melt is calculated from a known phase diagram and these results are discussed in relation with the dephosphorisation reaction.

#### The Characteristics of Water and Bubbling in a Cylindrical Vessel with Bottom Blowing

By Manabu IGUCHI *et al.*

ガスを底から吹き込んだ円筒浴内の気泡噴流領域に着目し、気泡の形状、寸法が主にノズル径とガス流量に支配される中間ガス領域において、噴流中の水の速度と乱

れ強さをレーザードップラー流速計 (LDV) により測定した。気泡に誘起される水の速度と乱れ強さの半径方向ならびに軸方向の分布の特徴を気泡の上昇特性に関係づけて解明した。さらに同じ容器内の水噴流を測定し、LDV による速度測定の妥当性および拘束噴流に及ぼす側壁の効果を調べた。

#### Activities of Na<sub>2</sub>O in CaO-based Slags Used for Dephosphorization of Steel

By J. J. PAK *et al.*

CaO 系スラグ中の Na<sub>2</sub>O の活量を β-Al<sub>2</sub>O<sub>3</sub> を用いた起電力法により測定し、CaO-Na<sub>2</sub>O-SiO<sub>2</sub> 系 1400°C の液相における等活量線を求めた。CaO 系スラグ中の Na<sub>2</sub>O の活量は、SiO<sub>2</sub> 濃度に強く依存し、Na<sub>2</sub>O の活量係数は、CaO 濃度の増大に伴って大きくなる。典型的な取鍋スラグである 50%CaO-40%Al<sub>2</sub>O<sub>3</sub>-10%SiO<sub>2</sub> 中の Na<sub>2</sub>O の活量は極めて高く、8 wt% の Na<sub>2</sub>O がこのスラグに存在する時、その活量は、50%Na<sub>2</sub>O-SiO<sub>2</sub> スラグの Na<sub>2</sub>O の活量と等しい。リチャードソンのモデルを用いると、実測値を良く再現できたので、CaO の活量を、このモデルを用いて計算した。Na<sub>2</sub>O の添加により、CaO の活量も大きく増加するという結果が得られた。

#### Electrical Conductivity of Molten High-alumina Blast Furnace Slags (Communication)

By S. B. SARKAR.

Electrical Conductivity of synthetic high-alumina blast furnace slags was measured with graphite electrodes.

Electrical Conductivity of the melts increases with increasing temperature. It is also found to increase with the addition of MgO in the melt and with higher basicity ratio defined as (%CaO + 0.7%MgO)/(0.94%SiO<sub>2</sub> + 0.18%Al<sub>2</sub>O<sub>3</sub>).

Activation energy for conduction has been found to decrease with the addition of MgO and increase with increasing Al<sub>2</sub>O<sub>3</sub>.

Possible explanations for these observations have been suggested from the ionic point of view.

#### Solidification Processing

##### The Modeling of Fluid Flow and Heat Transfer in Mold Filling

By Setsuo MISHIMA *et al.*

A mathematical representation has been developed for the filling of cylindrical molds, using a bottom pouring arrangement. In the model allowance has been made for thermal natural convection, solidification and for the