MULTIFUNCTIONAL CARBON BONDED FILTERS FOR METAL MELT FILTRATION

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There exists an increasing demand on the metal-making and metal-using industry to remove solid and liquid inclusions such as deoxidation products (oxides), sulfides, nitrides carbides etc. and thereby improve metal cleanliness. It is well known that size, type and distribution of non-metallic inclusions in metal decrease dramatically the mechanical properties of the cast products resulting to excessive casting repairs or rejected castings. Especially in means of light weight steel constructions, high strength and security steel components the filtration of metal melts opens the horizon for new metal qualities as well as covers the basic issue of material efficiency. Carbon bonded cellular foam ceramics present unique properties to fulfil the high thermomechanical and chemical requirements for the filtration of metal melts in the range from 600 up to 2000 °C, in foundries, in ingot casting plants as well as in continuous casting applications as smart filter systems, not only in iron but as well as in non-iron applications. This contribution explores the properties of carbon bonded filter systems at elevated temperatures as well as during filtration operation in contact with metal melts. The binder systems, the insitu "collector layer" formation for improved inclusion deposition as a function of different interactions of oxides with the carbon in the matrix, the insitu spinel formation in the matrix to counteract the shrinkage during casting, the impact of different oxidic active and reactive functional coatings for improved filtration efficiency, the contribution of nanoscaled additives in means of nano-engineered filters in the matrix and on the surface as well as prospects of non-conventional coating techniques such as the electrospinning will be demonstrated. In order to meet the future, global, industrial emissions targets a substantial improvement in recycling and the pursuit of material efficiency have to be achieved. Metal melt filtration techniques support strongly this goal.