PRESS RELEASE
For Immediate Release
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Ceralink Presenting 3 Talks at Daytona 2009

33rd International Conference & Exposition on Advanced Ceramics and Composites
Daytona Beach, FL - January 18-23, 2009

Monday, January 19, 2009

Time	Session Info / Title
1:20 PM - 5:20 PM, Coquina B (Hilton Hotel), **Microwave-Processing and SPS**	
1:20 - 2:00 PM	Microwave Assist Sintering of Porcelain Insulators with Large Cross-section, S. M. Allan; M.L. Fall; G. Carnahan; H. S. Shulman
2:40 - 3:00 PM	Microwave Assist Technology for Industrial Ceramic Processing, M.L. Fall; S.M. Allan; H.S. Shulman

Wednesday, January 21, 2009

Time	Session Info / Title
10:00 AM - 11:00 AM, Coquina D (Hilton Hotel), **Manufacturing Challenges**	
10:20 - 10:40 AM	Energy efficient radio frequency lamination of flat glass and ceramics for solar and armor applications, S.M. Allan, M.L. Fall; H.S. Shulman

Presentation Abstracts

Microwave Assist Sintering of Porcelain Insulators with Large Cross-section

ABSTRACT BODY: A fast energy-saving process was developed using Microwave Assist Technology (MAT) to sinter alumina-replaced porcelain insulators with large cross sections. MAT, a combination of microwave energy with electric or gas radiant heat, shortened an 88 hour conventional firing cycle to only 16 hours. Many ceramic systems have been successfully sintered using small samples, however large cross sections present new challenges, such as variable microwave energy distribution in the sample due to the microwave penetration depth, which varies as a function of temperature. A variety of physical and chemical changes occur in porcelain whitewares during firing that alter the electrical properties, which affect microwave absorption. The dielectric properties of alumina-replaced porcelain were measured up to the sintering temperature and compared against DTA, TGA, and the known reactions in the porcelain. Using these data and sample analysis, a process was developed to fire a 23 cm tall insulator composed of features with thickness from 1 to 11 cm, in 20% of the time required using conventional heating.

Microwave Assist Technology for Industrial Ceramic Processing

ABSTRACT BODY: Microwave Assist Technology (MAT), is the key to rapid successful processing of ceramic materials in today's energy sensitive state. MAT is the combination of traditional radiant (gas or electric) energy with volumetric heating (microwave) at the same time, in the same kiln. The microwave energy is used to heat the product, while the radiant heat sources act primarily to prevent heat loss from the surface of the products. The demonstrated benefits include uniform heating, shorter process times (faster throughput), energy savings, minimized thermal stresses, faster firing, and in certain cases, smaller grains and stronger materials. Pilot scale firing studies conducted in a 30 cubic foot MAT batch kiln will be presented. Case studies for refractories, advanced ceramics, electro ceramics, abrasives, and clay based products fired in a MAT tunnel kiln will also be presented. Manufacturing considerations, such as throughput, foot print, up-stream processes and costs for implementing MAT will be discussed.

Energy efficient radio frequency lamination of flat glass and ceramics for solar and armor applications

ABSTRACT BODY: A 60 second method for producing laminated flat glass, hard plastics (polycarbonate and acrylic), and transparent ceramics was developed. The process used radio frequency (RF) energy to selectively heat and melt interlayers (vinyls, PVB and EVA, and thermoplastic polyurethane, TPU) via dielectric heating. Energy was focused in the interlayer, without directly heating the glass or surroundings. Uniaxial pressure was simultaneously applied. The method was successfully demonstrated for the production of laminated silicon solar panels, metallized (low-e) glass, and multilayer transparent armor-like structures, up to at least 1 square foot. Demonstration results will be presented, along with strategies for scale-up of the workable product size. Various substrate and interlayer combinations were tested to determine the robustness of the process. Production energy savings from lamination with simultaneous pressure and RF energy resulted in approximately 90 % energy savings over autoclave and vacuum oven processes. RF lamination was found to be a fast flexible method for rapid-prototyping and production of laminates.

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