Studi Pengaruh Adisi Serbuk Kayu Terhadap Morfologi, Sifat Mekanis, dan Sifat Termal dari Keramik Berpori Berbasis Mullite Sebagai Kandidat Filter Pressure Filtration (Prefil) = Study of the Effect of Wood Saw Dust Addition on Morphology, Mechanical Properties, and Thermal Properties of Mullite-Based Porous Ceramics as Pressure Filtration (Prefil) Filter Candidates

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Abstrak

Keramik berpori merupakan jenis keramik yang terdiri dari material berongga tahan panas dengan bidang aplikasi yang luas, yaitu mencakup filter logam cair, filter gas suhu tinggi, penyangga katalis, dan insulator. Penelitian ini dilakukan untuk menyelidiki pengaruh adisi serbuk kayu terhadap morfologi, sifat mekanis, dan sifat termal dari keramik berpori berbasis mullite sebagai filter aluminium cair. Bahan baku yang digunakan mencakup kaolin dan chamotte sebagai bahan dasar, serbuk kayu sebagai agen pembentuk pori, serta carboxymethyl cellulose (CMC) dan air sebagai pengikat keramik. Penelitian dimulai dengan mencampur bahan baku dengan variabel kandungan serbuk kayu: 0%, 5%, 10%, dan 15%. Hasil campuran kemudian dicetak dengan metode dry press, dibakar selama 120 menit hingga suhu 650 °C, assembly dengan kaolin tipis, dibakar lanjut selama 120 menit hingga suhu 1200 °C, dan filter lokal berbasis mullite didapat. Filter kemudian dikarakterisasi, menunjukkan hasil bahwa adisi serbuk kayu berpengaruh membentuk pori berbentuk serat bertipe terbuka pada mikrostruktur keramik dengan jumlah meningkat, tidak terdeteksinya perubahan panas signifikan akibat dekomposisi, peningkatan koefisien ekspansi termal (dari 0,0071–0,0371%) dan permanent linear change (dari 0,0025–0,0345%), peningkatan porositas semu (dari 33,29–47,95%) dan peresapan air (dari 18,27–33,05%), serta penurunan pada kuat lentur (dari 13,48 - 6,33 MPa) dan densitas (dari 1,82–1,43 g/cm3), dengan adisi serbuk kayu dari 0% hingga 15% pada filter lokal. Kandungan serbuk kayu optimum pada filter lokal ada pada nilai 15.

.....Porous ceramic is a ceramic type consisting of heat-resistant porous material with widespread application, which includes liquid metal filters, high temperature gas filters, catalyst supports, and insulators. This research was conducted to investigate the effect of wood sawdust (WSD) addition on the morphology, mechanical properties, and thermal properties of mullite-based porous ceramics as molten aluminum filter. The ceramic raw materials used include kaolin and chamotte as base material, WSD as pore-forming agent (PFA), as well as carboxymethyl cellulose (CMC) and water as binder. The research was started by mixing the raw materials with a variety of WSD content: 0%, 5%, 10%, and 15%. The mixture was then formed using the dry press method, sintered for 120 minutes to 650 °C, assembled with thin kaolin, further sintered for 120 minutes to 1200 °C, and a mullite-based local filter was obtained. Filter was then characterized, showing results that addition of WSD had an effect on the formation of open-type pores in the form of fibers on the ceramic microstructure with an increasing number, no significant heat exchanges from decomposition were detected, increased coefficient of thermal expansion (from 0.0071–0.0371%) and permanent linear change (from 0.0025–0.0345%), increased apparent porosity (from 33.29–47.95%) and water infiltration (from 18.27-33.05%), as well as decreased flexural strength (from 13,48 - 6,33 MPa) and density (from 1.82–1.43 g/cm3), with increased content of WSD from 0% to 15% on the local filter. The

optimum sawdust content in the local filter is at a value of 15%.