Research & Reviews

Research & Reviews: Journal of Material Sciences

ISSN 2321-6212

2020

Vol.8 No.4

Transparent soda-lime glass fabrication with silica from rice husk ashes

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Abstract

Rice husk (RH) is an agriculture residue with low added value, considered an high risk environmental pollutant if discarded improperly: it causes soil desertification, increases in air $C0_2$ content when burnt, and long-term health problems if inhaled – i.e. silicosis. It can be estimated that 140 million tons of RH are recovered from rice harvesting every year in the world, and 2,5% are produced in the south of Brazil. Moreover, RH has a very high silica content, almost 20% of net husk weight. For these reasons, the project aims to extract and purify silica from RH with the intent to produce transparent soda-lime glasses, creating an added value product from an agricultural waste. As silica from RH contains traces of iron oxide and manganese oxide, glass made with untreated silica from RH are generally red-brownish in color. Thus, several factors were investigated in order to obtain the best transparency in the visible region: rice husk chemical pre-treatments (acid lixiviation), with hydrochloric acid (4% and 10%, A2-A3 samples) and sulfuric acid (4% and 10%, A4-A5 samples); rice husk calcination conditions (temperature and time); and the addition of transition metal oxides to the glass matrix to form transparent metal complexes. The results were very promising: acid lixiviation does remove the transition metal impurities almost totally, producing a ~80% transparent glass in the visible region. Moreover, with the addition of antimony (1%) it was possible to produce a glass transparency equivalent to glass made by sand silica.

Biography:

Chiara Valsecchi graduate in Chemistry from the University of Milano – Bicocca, Italy, in 2009, received her Master degree from the University of Victoria, Canada, in 2013 and her PhD from the Federal University of Rio Grande do Sul (UFRGS), Brazil, in 2018. During the first years, she specialized on the study, characterization and fabrication of gold nanoholes arrays as biosensors based on surface plasmon resonance. More recently, she started to focus on material and biomaterial synthetization and characterization, in order to aggregate value to a large industrial waste present in the rural part of the south -west side of Brazil. Currently, she works on silica and activated carbon based filters for water purification and, particularly, silica extraction from bio-waste for glass production and applications.

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6th International Conference on Ceramics and Composite Materials; Webinar- June 08-09, 2020.

Abstract Citation:

Chiara Valsecchi, Transparent soda-lime glass fabrication with silica from rice husk ashes, Ceramics 2020, 6th International Conference on Ceramics and Composite Materials; Webinar-June 08-09, 2020

(https://ceramics.insightconferences.com/abstract/2020/transparent-soda-lime-glass-fabrication-with-silica-from-rice-husk-ashes)