



Review

A synopsis about perlite as building material – A best practice guide for Civil Engineer



Alaa M. Rashad

Building Materials Research and Quality Control Institute, Housing & Building National Research Center, HBRC, Cairo, Egypt

HIGHLIGHTS

- EP aggregate reduced mechanical strength, but increased thermal and sound resistance.
- EP aggregate increased porosity, sorptivity and water absorption.
- EP powder increased compressive strength and mitigated ASR.
- EP can be used as a source material for geopolymer or as part of aggregate.
- Different additives can be used to enhance some properties of EP matrices.

ARTICLE INFO

Article history:

Received 11 February 2016

Received in revised form 30 May 2016

Accepted 1 June 2016

Keywords:

Expanded perlite

Lightweight

Fresh properties and hardened properties

Durability

ABSTRACT

Perlite is a common name for amorphous volcanic silicate/alumina rock which can be expanded when rapidly heated at 900–1200 °C. Utilization occasions of perlite have made the product adjustable to abundant applications in construction, petrochemical industries, industrial, chemical and horticultural. In construction, expanded perlite (EP) can be used as a part of cement or aggregate in traditional cementitious materials or as a source material for geopolymers. EP in construction deals good thermal and sound insulation, good fire resistance and low density. Subsequently perlite seems to be a very important material. In this paper, the author reviews the effect of EP which used as a part of building material on fresh properties and hardened properties of traditional cementitious materials, geopolymers as well as other binders. Furthermore, different additives which used to improve some properties of EP matrices have been reviewed.

© 2016 Published by Elsevier Ltd.

Contents

1. Introduction	339
2. Traditional cementitious materials	340
2.1. Workability and setting time	340
2.2. Unit weight	341
2.2.1. Fresh unit weigh.	341
2.2.2. Dry unit weight	341
2.3. Mechanical strength	342
2.3.1. Mortar, brick and plaster	342
2.3.2. Concrete	343
2.4. Shrinkage	345
2.5. Water absorption, permeability, porosity and sorptivity	345
2.6. Chemical resistance and alkali-silica reaction	346
2.7. Thermal conductivity and thermal diffusivity	347
2.8. Sound insulation, fire resistance and thermal resistivity	348
3. Geopolymer and other binders	348
4. Additives to improve some properties of perlite matrix	349

E-mail addresses: alaarashad@yahoo.com, a.rashad@hbrc.edu.eg<http://dx.doi.org/10.1016/j.conbuildmat.2016.06.001>

0950-0618/© 2016 Published by Elsevier Ltd.

4.1. Cementitious materials 349
 4.2. Fibers 349
 4.3. Other materials 350
 5. Advantages/disadvantage of perlite 351
 6. Usability and perlite applications 351
 7. Remarks and scope for future research. 351
 References 352

1. Introduction

Perlite is not a trade name, but a common term for naturally occurring siliceous volcanic rock. The distinguishing feature which arrangements perlite apart from other volcanic glasses is that when rapidly heated to its softening temperature which ranging between 900 °C to 1200 °C, it expands approximately from 5 to 20 times its original volume [1] (Fig. 1). This accounts for excellent light weight and insulating properties. The expanded material is brilliant white (Fig. 2), due to reflectivity of the trapped bubbles.

The particles are hollow and porous with many shapes. It was estimated that there are approximately 2530 and 2680 thousand metric tons of perlite were produced around the world during 2014 and 2015, respectively [2]. Perlite mines are located in several countries around the world (Fig. 3). The main 6 countries which accounted approximately 97% of the world production of perlite are Turkey, Greece, USA, Japan Hungary and Italy [2].

Perlite ore consists mainly of SiO₂, Al₂O₃ and lesser amounts of several metal oxides such as sodium, potassium, iron, calcium and magnesium. EP has several attractive physical properties (Table 1)

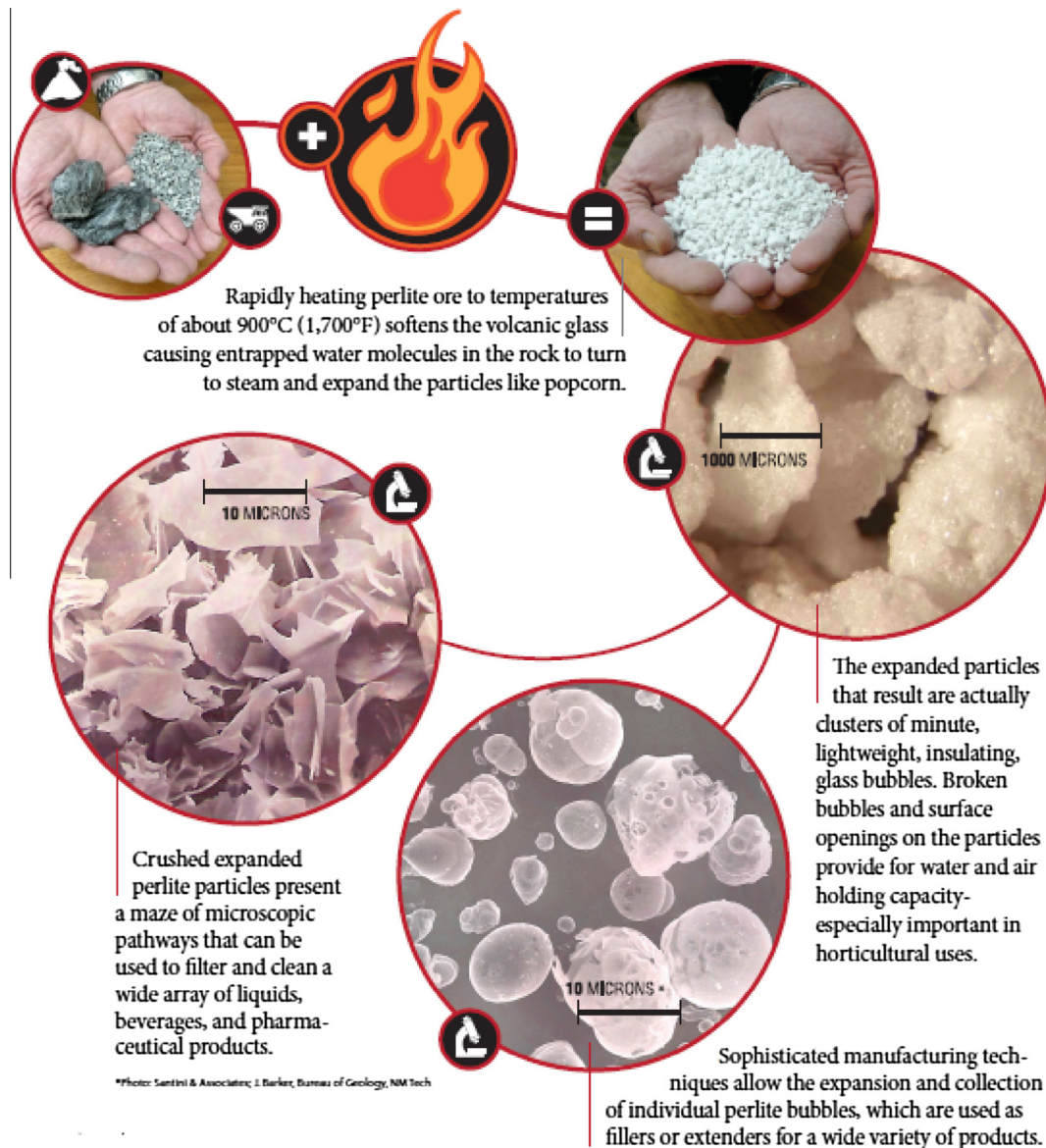


Fig. 1. EP production (www.perlite.org).

Download English Version:

<https://daneshyari.com/en/article/6718092>

Download Persian Version:

<https://daneshyari.com/article/6718092>

[Daneshyari.com](https://daneshyari.com)