CHAPTER II

LITERATURE REVIEW

There are some theories and research that will be used as references and comparison for this project

2.1. Theories

According to Davidovits (2011), Geopolymer can be defined as material resulting from biosynthesis polymeric aluminosilicate and alkali-silicate that produce a polymer framework SiO_4 and AlO_4 tetrahedra bound.

The main advantage of Geopolymer concrete is that it is environmental friendly. To produce a good quality of geopolymer concrete, it needs to be mixed with alkali activator

According to Jiang (1997), *"alkali activation is the term used to imply that alkalis or alkali earth ions are used to stimulate the pozzolanic reaction or release the latent cementitious properties of finely divided inorganic materials. The materials could be minerals as well as industrial by-products consisting primarily of silicates, aluminosilicate and calcium".*

According to Bakharev, Sanjayan, & Cheng, (1999), recent research has shown that it is possible to use 100% fly ash or slag as the binder in mortar by activating them with an alkali component, such as; caustic alkalis, silicate salts, and non-silicate salts of weak acids.

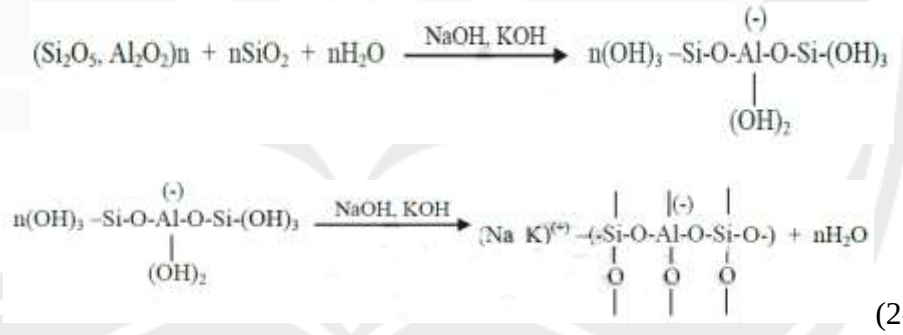
According to Brough & Atkinson, (2002); Deja, (2002), there are two models of alkali activation. Activation by low to mild alkali of a material containing primarily silicate and calcium will produce calcium silicate hydrate gel (C-S-H), similar to that formed in Portland cements, but with a lower Ca/Si ratio.

2.2. Another Research to Compare

2.2.1. Thesis Research

According to Efendi (2014), discus about the effect of solid material; fly ash and rice husk ash to geopolymer concrete with alkaline activator sodium silicate and sodium hydro. The materials that were used are fly ash, rice husk ash, fine aggregate, coarse aggregates, and distilled water. The compression test value of the research in 28 days: 100:0, 95:5, 90:10, 85:15, 80:20, 75:25 are 17.43834 MPa, 3.571159 MPa, 6.940354 MPa, 7.093094 MPa, 3.051927 MPa, 2.960489 MPa. Geopolymer concrete with fly ash 100% can be used as structural concrete if the working process is done correctly. In this research the highest value of compression strength is 21.20305.

According to Sitindaon (2014), his final project discussed about the effect of plasticizer to the compressive strength of geopolymer concrete. This concrete also uses fly ash and rice husk ash with alkaline activator sodium silicate and sodium hydro. The differences between these two topics are plasticizer. The materials of this concrete are fly ash, rice husk ash, aquades, fine aggregate, coarse aggregate, activator; Sodium Silicate (Na_2SiO_3) and Sodium Hydroxide (NaOH). In geopolymer, there is a reaction between alumina-silicate oxide (Si_2O_5, Al_2O_2) and alkali poly-silicate that have Si-O-Al as the reaction.



(2-1)

Based on the research the compression strength values with plasticizer as follows:

100:0 = 9.71 MPa, 95:5 = 1.69 MPa, 90:10 = 4.38 MPa, 85:15 = 73 MPa, 80:20 =1.21 MPa, 75:25 = 3.37 MPa while the compression strength values without plasticizer in 28 days as follows:

100:0 = 17.44 MPa, 95:5 = 3.57 MPa, 90:10 = 6.94 MPa, 85:15 = 7.09 MPa, 80:20 = 3.05 MPa, 75:25 = 2.96 MPa

According to the research of Lisantono and Hatmoko (2009), in their research about Geopolymer Concrete Made with Bagasse Ash and Metakaolin, the compressive strength values of the three types of Geopolymer Concrete are generally very low. At 14 days, the compressive strength values as follows: bagasse ash = 0.325 MPa, metkaolin = 0.560 MPa, bagasse ash and metakaolin = 0.380 MPa while the compressive strength values at 28 days as follows: bagasse ash = 0.344 MPa, metkaolin = 0.721 MPa, bagasse ash and metakaolin = 0.852 MPa. However, geopolymer concrete based on the mixture of bagasse-ash with metakaolin gives the highest compressive strength compared to other and can be developed for future research.