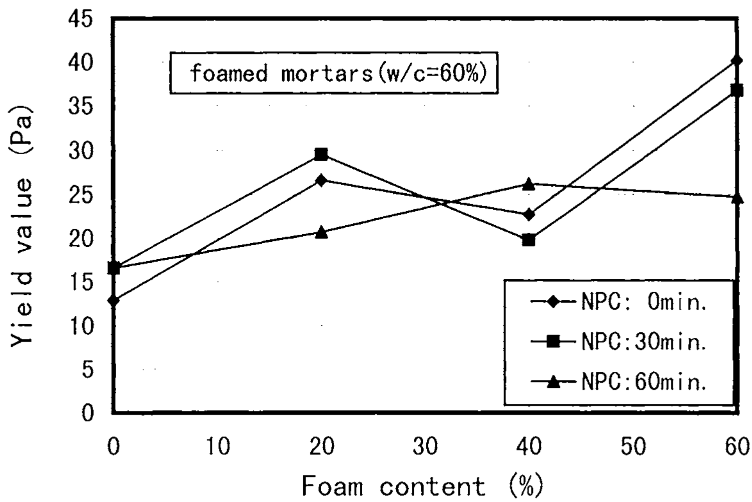

Fig. 12—Yield value of fresh mortars

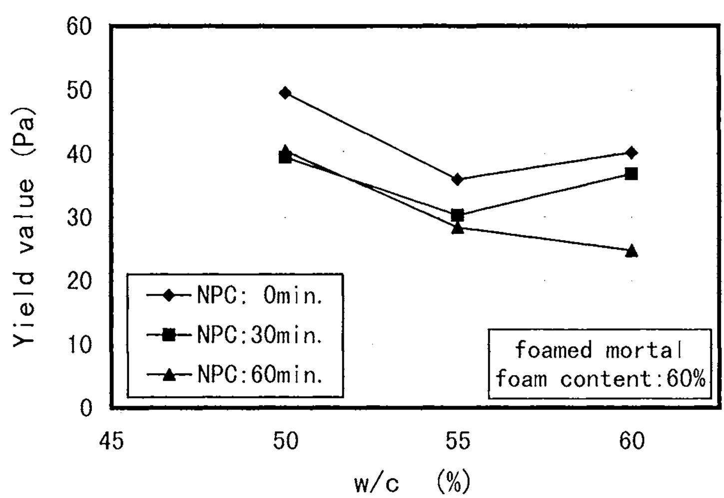

Fig. 13—Yield value of fresh mortars

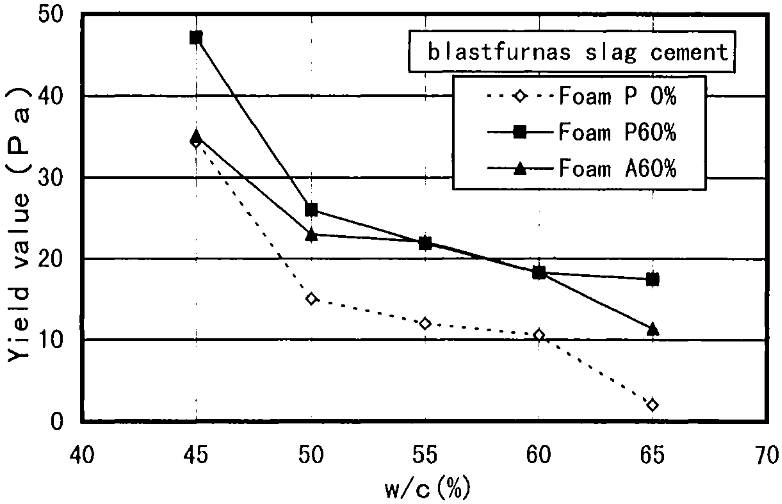

Fig. 10—Yield value of fresh cement pastes

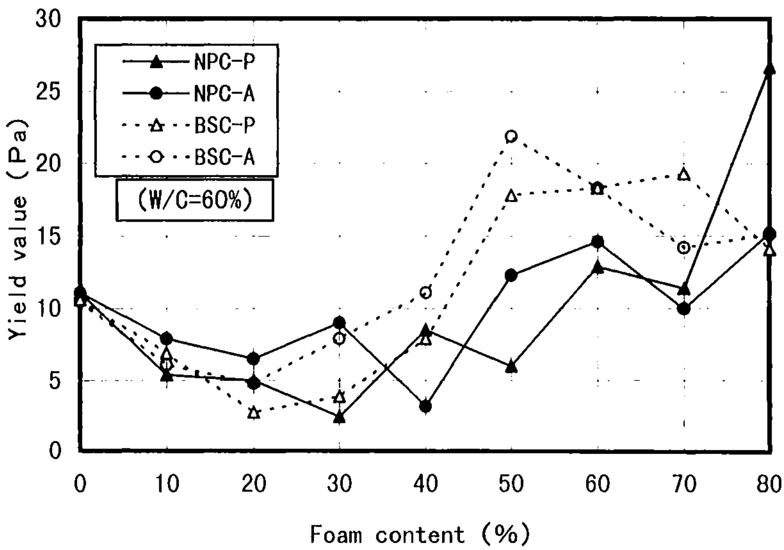

Fig. 11—Yield value of fresh cement pastes

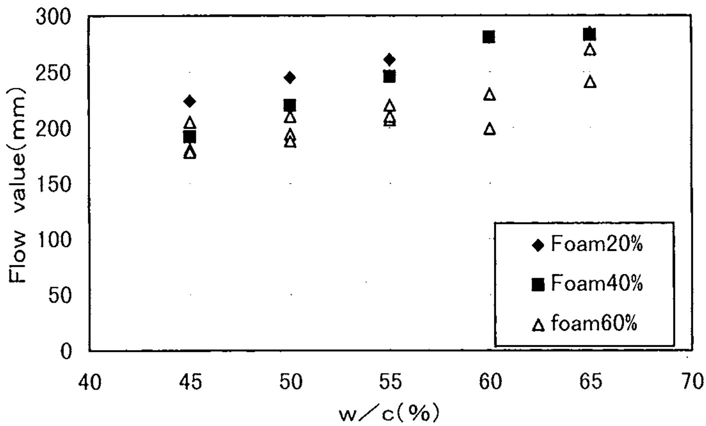

Fig. 14—Flow value of foamed cement pastes

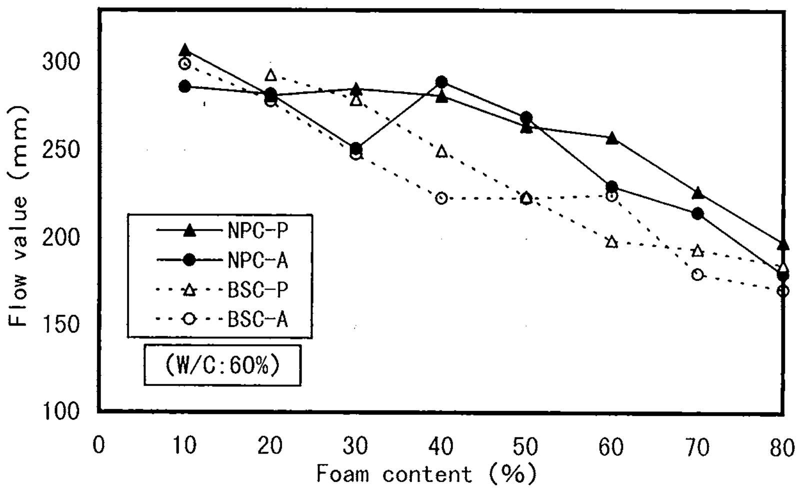

Fig. 15—Flow value of foamed cement pastes at constant w/c

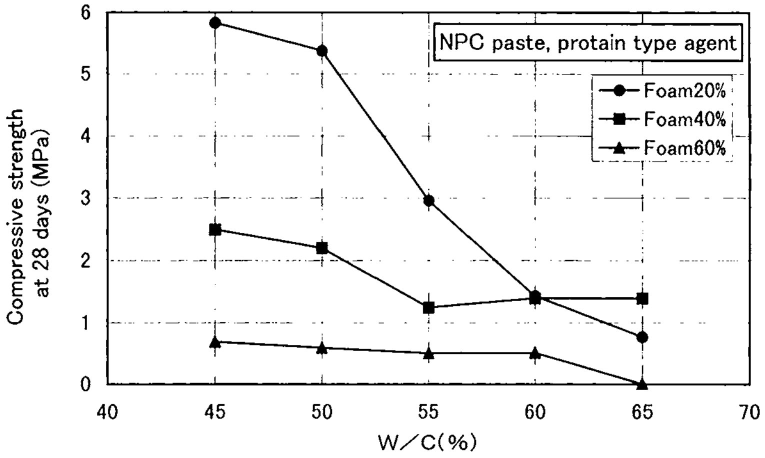

Fig. 16—Compressive strength of foamed pastes

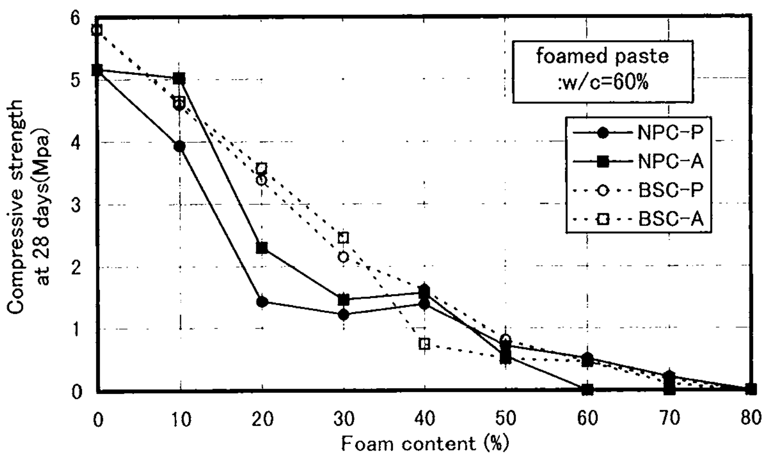

Fig. 17—Compressive strength of foamed cement pastes

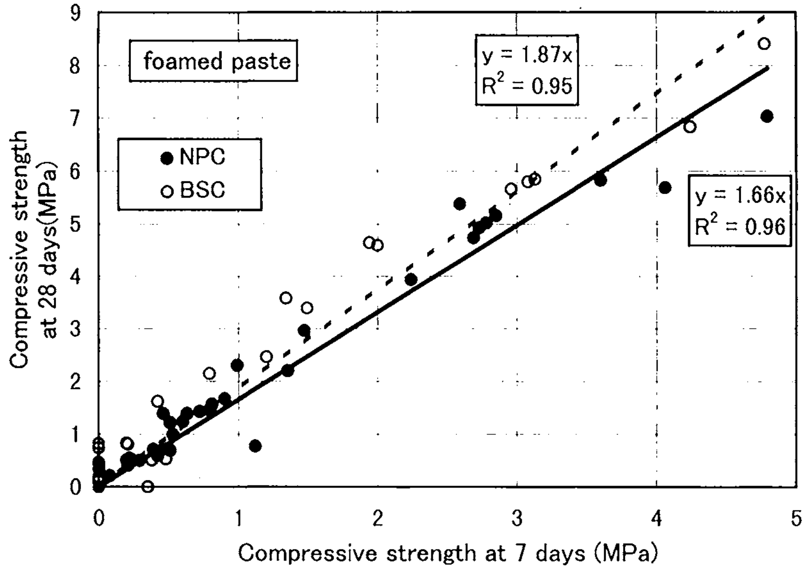

Fig. 18—Compressive strength development of foamed cement pastes

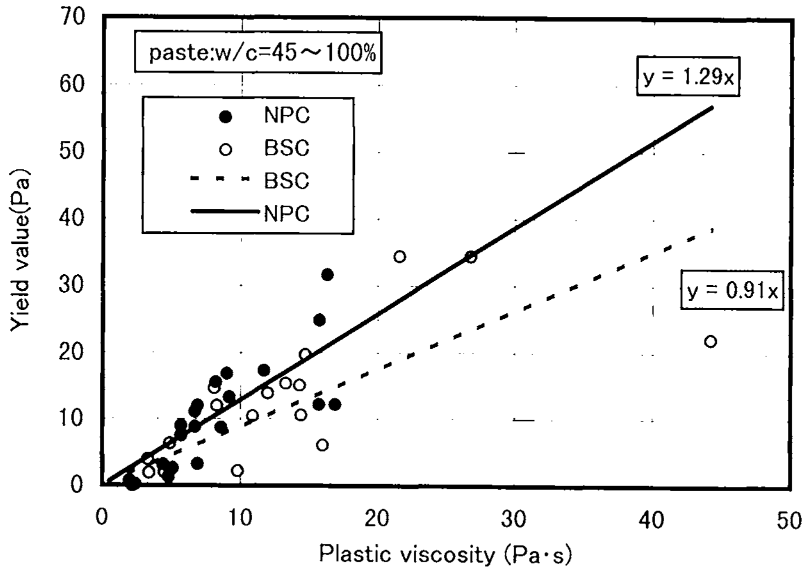

Fig. 19—Relationship between yield value and plastic viscosity of foamed cement pastes

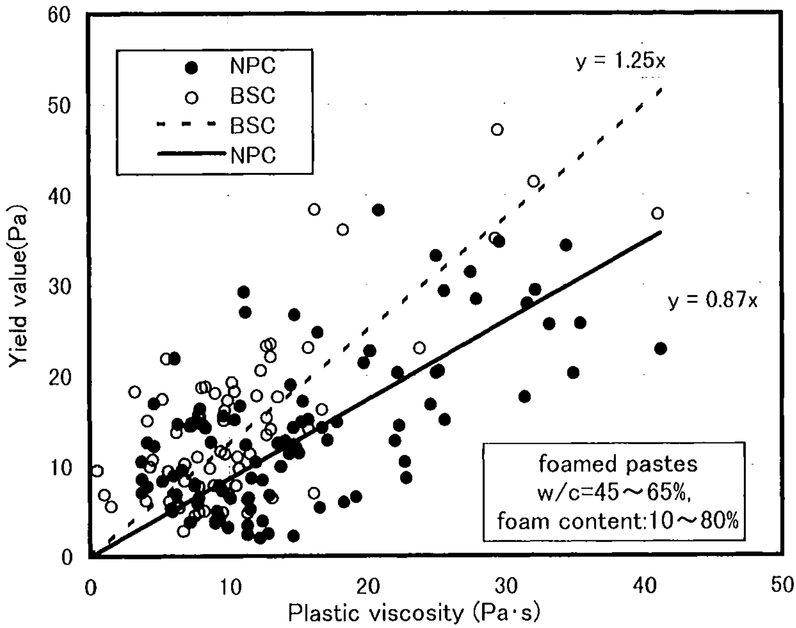

Fig. 20—Relationship between yield value and plastic viscosity of foamed cement pastes

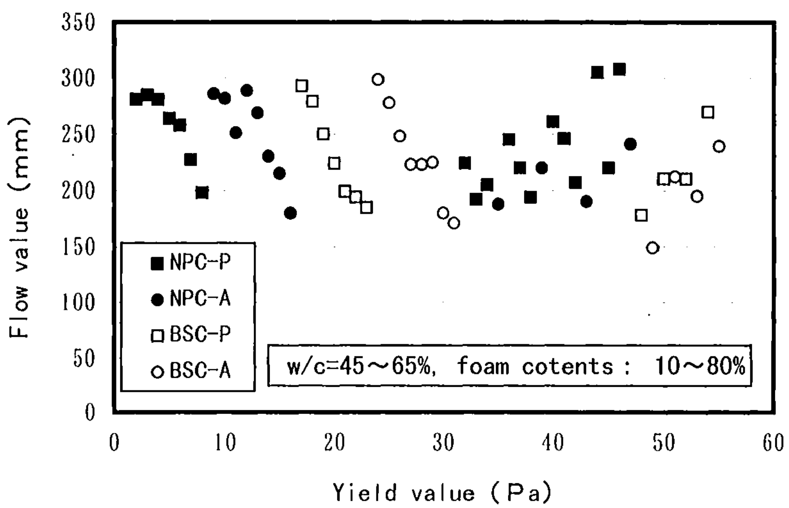

Fig. 21—Relationship between yield value and flow value of foamed cement pastes

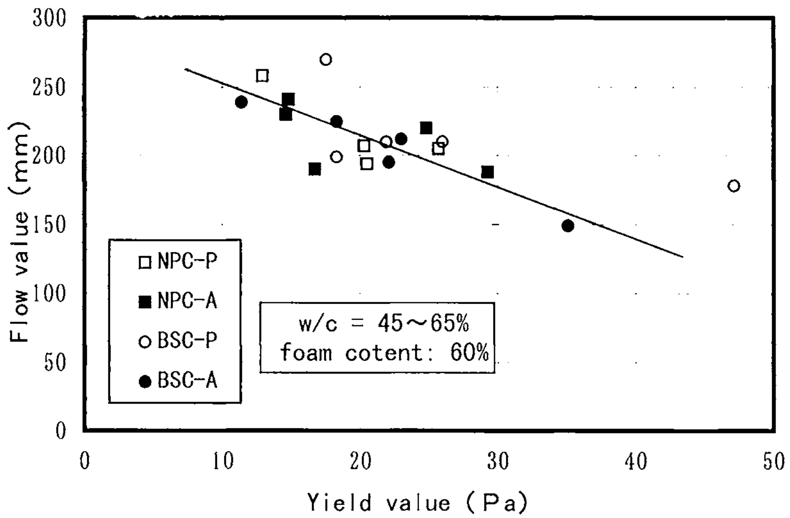

Fig. 22—Relationship between yield value and flow value of foamed cement pastes at constant foam content

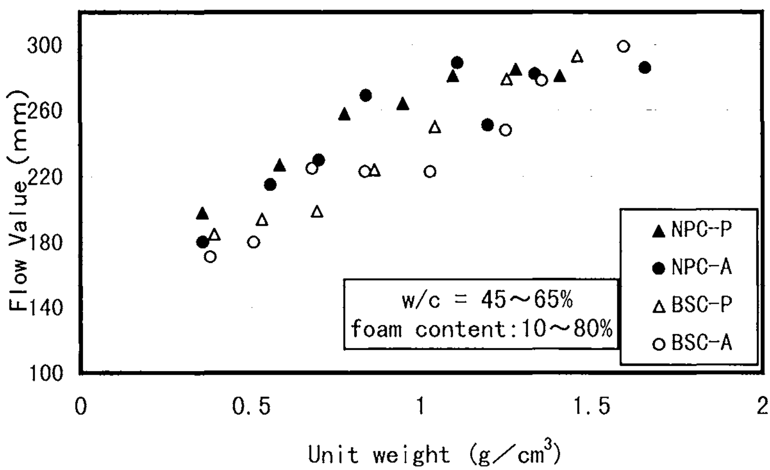

Fig. 23—Relationship between unit weight and flow value of foamed cement pastes

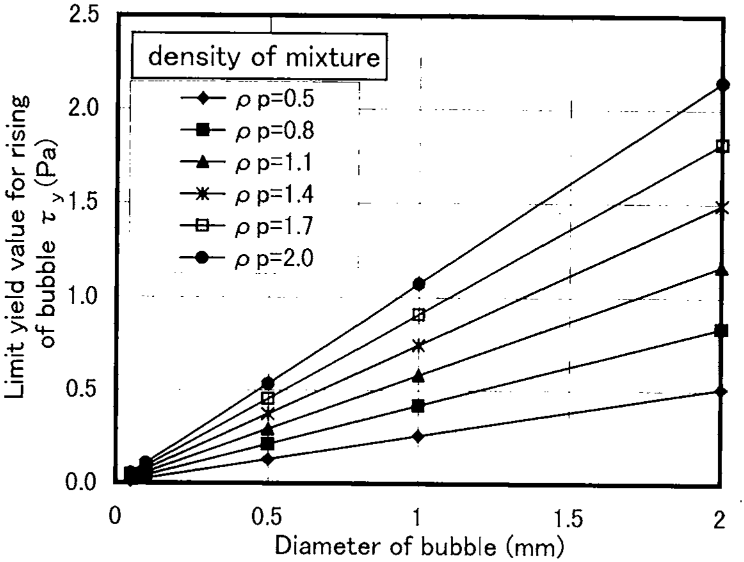

Fig. 24A—Limit yield value of the mixture for rise of a bubble

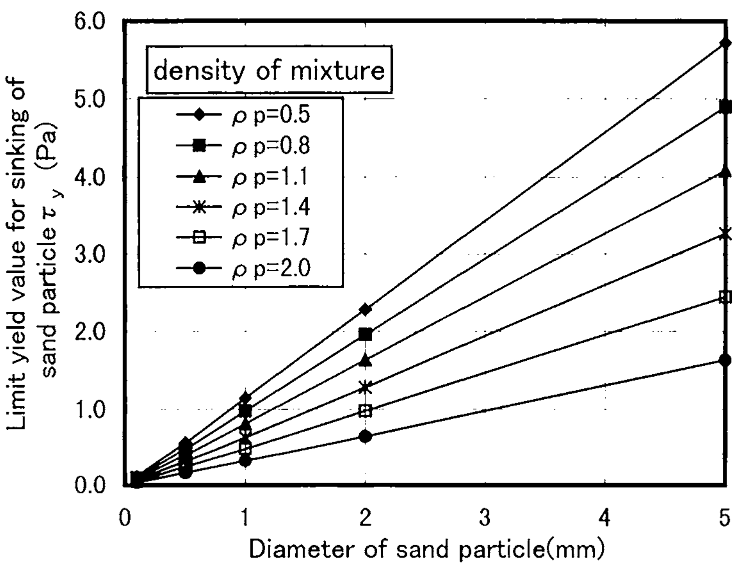

Fig. 24B—Limit yield value of the mixture for sink of a sand particle

SP 173-18

Effects of Binding Materials and Chemical Admixtures on Rheological Constants of Fresh Paste

by Shinzou Nishibayashi, Akira Yoshino, K. Yamura, Y. Okawa and M. A. Peres Lara

Synopsis: This paper describes the effects of properties of powder such as specific surface and solid volume percentage on the plastic viscosity of fresh paste with admixtures. Eight types of blended powder and three types of high-range water-reducing admixtures (HRWRA) were used, and the plastic viscosity of paste mixed with these materials was measured, keeping the yield value of paste constant.

The fresh paste is considered to be a type of highly concentrated suspension, so the authors propose a method to predict plastic viscosity based on this concept. In this method, the ratio of powder content, the specific surface, and solid volume percentage of powder, the type of admixture, and other factors are taken into account.

Keywords: Admixtures; plastics; rheological properties; viscosity; water

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INTRODUCTION

In recent years there has been greater demand for the workability of fresh concrete to be estimated from physical constants (rheological constants) instead of values derived from empirical tests. Many believe that the estimation of workability in terms of rheological constants will promote both the systemization and automation of concrete construction work(1). Nevertheless, there are problems associated with concrete construction based on the rheological constants of concrete. One is the establishment of a method to calculate mixture proportions that will produce concrete with the required rheological constants. In pursuing a solution to this problem, it is helpful to think of pastes, mortars, and concretes as highly concentrated suspensions and to consider the rheological constants of the mixture in terms of both the concentration and the properties of the suspended particles.

In this study, we investigated the effects of physical properties of powder and types of chemical admixture on the rheological constants (especially plastic viscosity) of paste. We examined a method to calculate the plastic viscosity of paste, based on the properties of mix constituents and mixture proportions.

EXPERIMENTS

Materials

Normal portland cement, two kinds of blast-furnace slag and limestone powder were used in this experiment. The physical properties and the chemical constituents of these materials are show in Tables 1 and 2. Eight types of powder were prepared