

エココンクリートにおけるASRに関する問題解決のための基礎研究

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2003 Fiscal Year Final Research Report Summary

Alkali Silica Reaction in Concrete Using a New Portland Cement Made from Municipal Waste Incinerator Ash

Research Project

Project/Area Number

14550463

Research Category

Grant-in-Aid for Scientific Research (C)

Allocation Type

Single-year Grants

Section

一般

Research Field

土木材料・力学一般

Research Institution

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2002 - 2003

Keywords

Alkali Silica Reaction / Waste glass / Lithium Ions / Expansive Pressure / Expansion / 膨張圧 / 等価アルカリ量 / リサイクル

Research Abstract

The results obtained in this study are as follows ;

- (1) Measured expansions due to the alkali silica reaction in mortars containing a crushed bottle glass aggregate were far greater than in mortars made with the Pyrex glass aggregate.
- (2) The lithia glass powder was conspicuously effective in the suppression of the alkali silica reaction as compared with the bottle glass powder. Great reduction in expansion with the addition of the lithia glass powder appear to be derived from the nature of the glass powder as a pozzolan and the lithium released from the glass.
- (3) The addition of as much as 20% fly ash completely suppressed ASR expansion even in high alkali cement mortars with the crushed bottle glass aggregate.
- (4) The expansive pressure generated under longitudinal restraint was in proportion to free expansion except that the 15% calcined flint-containing mortars with a high Na₂O_e of 2.0 and 2.5% showed high expansions, but low expansive pressures. This exceptional behavior of the alkali-rich mortars appears to be due to the production of alkali-rich ASR gels.
- (5) The results obtained in the expansive pressure experiment suggest that, even if concretes containing ASR gels with a high alkali content exhibit great expansions in laboratory expansion tests, damages due to secondary stresses induced by the expansive pressure in concrete members under restraint may not be significant.
- (6) The intrusion of lithium ions into mortar with a reactive aggregate could arrest the expansion of mortars shortly after immersion in 0.5 N LiOH solution.
- (7) Expansion of mortars started decreasing earlier in mortars pre-cured in sealed in vinyl sacks for longer periods.
- (8) The alkalis in most ASR gels not far from interfaces between the cement paste and reactive aggregate particles appear to be replaced by the lithium ions supplied from the external solution

Research Products (22 results)

All Other

All Publications (22 results)

[Publications] Kawamura, M., Juni, M., Sugimasa, Y.: "Suppression of ASR in the Reuse of Various Waste Glasses as Concrete Aggregate by the Addition of Mineral Admixtures" Proceedings of the First International Symposium on Non-Traditional Cement & Concrete, Brno, Czech Republic. 274-291 (2002) ▼

[Publications] Kawamura, M.: "Estimation of the Amounts of ASR Gels by the Combination of EDS and Pore Solution Analysis and Measurements of Expansive Pressure in Mortars Under Restraint" Proceedings of the 24th International Conference on Cement Microscopy, San Diego, U.S.A.. 317-335 (2002) ▼

[Publications] Kawamura, M., Fuwa, H.: "Effects of Lithium Salts on ASR Gel Composition and Expansion of Mortars" Cement and Concrete Research. Vol.33, No.6. 913-919 (2003) ▼

[Publications] 佐野主典, 川村満紀: "廃棄自動車フロントガラスのアルカリ反応性"第57回土木学会年次学術講演会概要集, 第5部門. (2003) ▼

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[Publications] Kawamura, M., Iwahori, K: "Some Theoretical Considerations on Expansive Pressure of ASR Gel" Proceedings of the 12th International on Alkali Aggregate Reaction, Beijing, 2004.. (in Press). (2004) ▼

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[Publications] Sano, K., Kawamura, M.: "Alkali Reactivity of Waste Glass of the Windscreen of Cars"Proc.of the 57th Annual Meeting of JSCE. Division V. (2003) ▼

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[Publications] Kawamura, M., Kodera, T.: "Effects of Externally-Supplied Lithium on the Suppression of ASR Expansion in Mortars"Cement and Concrete Research. (in Press). ▼

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