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Tran et al.

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(54) **METHODS FOR GENERATING BISPECIFIC FUNCTIONAL AGENTS**

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(58) **Field of Classification Search**
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See application file for complete search history.

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(56) **References Cited**

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U.S. PATENT DOCUMENTS

9,365,846 B2 * 6/2016 Shaheen C07K 16/00
9,683,226 B2 * 6/2017 Wang C07K 16/00
2018/0334666 A1 * 11/2018 Tran C07K 16/005

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 341 days.

OTHER PUBLICATIONS

(21) Appl. No.: **16/031,533**

Shaheen et al. 2013 "A dual-mode surface display system for the maturation and production of monoclonal antibodies in glyco-engineered *Pichia pastoris*." PLoS One 8: e70190 (Year: 2013).*
Doerner et al. (FEBS Letters 588 (2014) 278-287) (Year: 2014).*
U.S. Appl. No. 15/986,025, filed May 22, 2018 entitled "Triple-Mode System for Antibody Maturation, Surface Display and Secretion".
U.S. Publication No. 2017/0183645 published Jun. 29, 2017 entitled "Composition and Method for Diversifying Polypeptide Libraries".

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* cited by examiner

(60) Provisional application No. 62/509,360, filed on May 22, 2017, provisional application No. 62/530,960, filed on Jul. 11, 2017.

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(51) **Int. Cl.**

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(57) **ABSTRACT**

The present invention provides a method for preparing a modular scaffold that can bind to a target antigen and a method for engineering a bispecific functional agent consisting of an existing polypeptide binder fused at its C-terminus with said modular scaffold.

(52) **U.S. Cl.**

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